



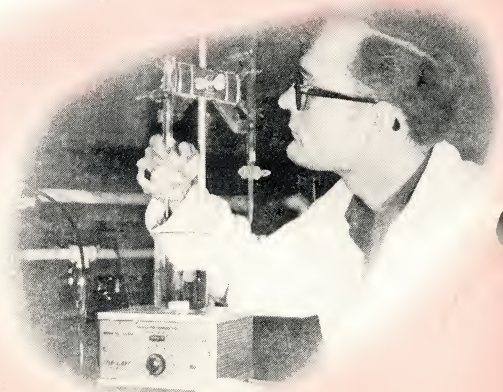
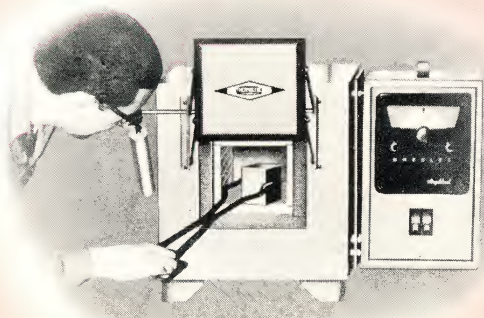
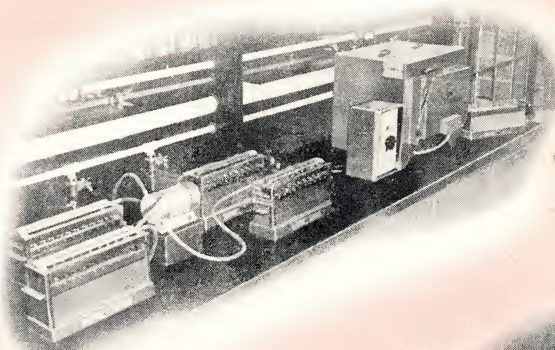
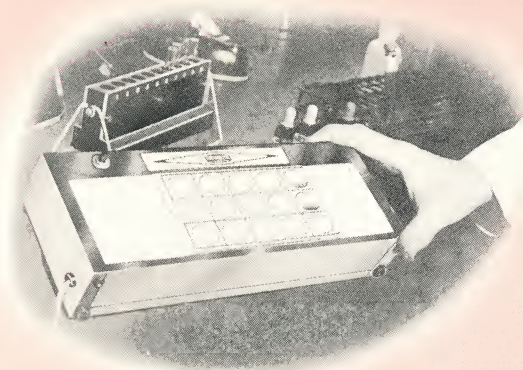
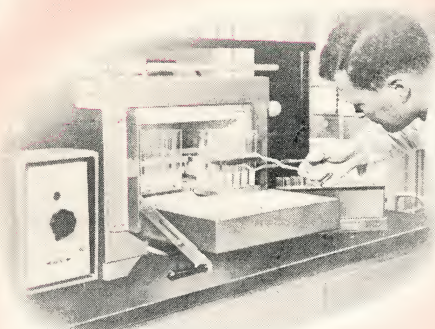
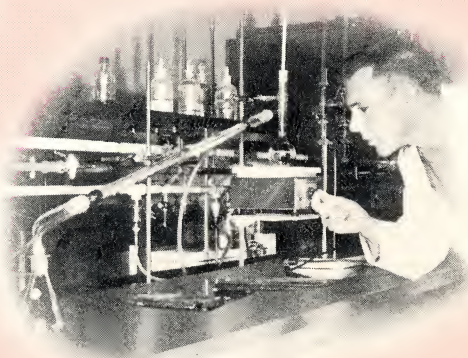
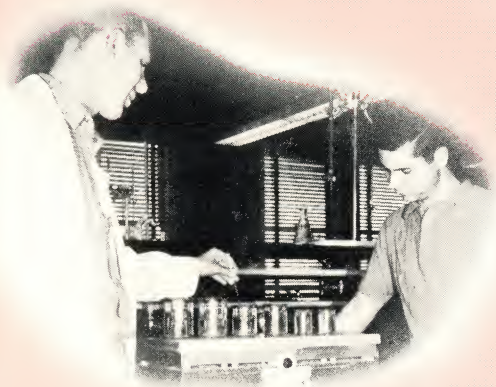
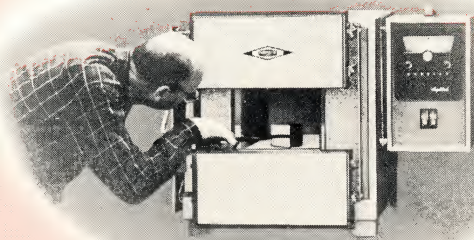
**ELECTRICAL  
LABORATORY  
APPARATUS**

for  
heat / light / motion

*"Lab accepted standard of quality"*

Manufactured by: THERMOLYNE CORPORATION, DUBUQUE, IOWA, U.S.A.









CORPORATION

## LABORATORY APPARATUS

Catalog 65  
Issued February 1965

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# ELECTRIC FURNACES

## GENERAL INFORMATION

Electric furnaces and their controls are deceptive in their apparent simplicity. There are many subtle problems in design, installation, and operation of furnaces which are not widely known by furnace users. Understanding these factors should help a prospective user make a wiser selection and a furnace user get the most benefit from his furnace. THERMOLYNE engineers are aware of these factors of furnace construction, and are constantly working to develop practical solutions to the problems and incorporate the latest knowledge into products of wide usefulness and high quality.

A muffle furnace is basically a thermally insulated heated chamber. The heating elements are the heart of these furnaces, and the most common elements are metallic resistance alloys. A few companies have specialized in the development of these alloys, and the furnace designer in turn applies these alloys to best advantage. THERMOLYNE engineers use two basic types of alloy for heating elements; nickel-chromium and iron-chromium-aluminum. Although these two metals seem competitive, they really are complementary. Nickel-chromium alloys have the most resistance to attack from the widest variety of corrosive agents encountered in laboratory use, including alkali halides, but iron-chromium-aluminum alloys are more resistant to sulfur and its compounds. Nickel-chromium alloys are limited to working temperatures below 1100°C for economical life, while iron-chromium-aluminum alloys may be operated at 1260°C with comparable life. Thus both the products of combustion expected to be released in the chamber and the operating temperature influence the choice of element material.

For a given furnace design heat must be supplied to the chamber at a given rate. This can be done by using elements with a small surface area and a large temperature difference between the element and the chamber, or elements with a large area and a small temperature difference. Because wire life is decreased approximately 50% for each 50°C temperature rise, the latter is much preferred by THERMOLYNE engineers. A primary factor determining the element to chamber temperature difference is the amount of power dissipated per unit area of the element wire. Six to ten watts per square inch is good design. The lower this figure, the lower the temperature difference. Power density can be decreased by winding coils more closely, crowding more wire in to the same space. This increases the radiating surface; however a given turn has more difficulty radiating its heat. As coils get too close this tends to nullify any apparent gain, and tends to produce inter-coil shorting with burnout at the shorting point.

Another major problem of furnace construction is support of the heating element wire. There are three well known means of doing this: open coil design is most common, muffle core construction is used, and wire coils embedded in refractory plates, which is the most recent, and where possible, most desirable. Initially embedding utilized a fritted glassy bond refractory which softened at high temperature. THERMO-

LYNE engineers developed a chemically bonded refractory cement which overcomes this difficulty; it has good mechanical strength, high electrical resistivity to prevent intercoil shorting, high temperature capability, resistance to thermal shock, high thermal conductivity to aid in dissipation of heat, low chemical activity, freedom from spalling and dusting, and dimensional stability. The embedding process preserves the optimum coil shape and placement of the coils by preventing "creep" of the hot wires, deformation of the coil loops caused by sag of the heat softened wire, protects the soft coils from damage from loading tools, and the refractory plate also acts as a "surge reservoir" of heat energy, thus contributing significantly to even temperatures. This construction also makes replacement of heating elements quick, easy, and reliable.

The final "thermally functional" part of the furnace is the insulation. Broadly speaking, there are two types available—firebrick and "soft insulation". Firebrick is mechanically more durable and is used for wear parts of the furnace interior; soft insulation is weak mechanically, but has a much higher insulation value. THERMOLYNE engineers utilize the best features of both in a combination of scientifically proportioned layers of these materials where each can contribute most to durability and quality of the whole design.

The shell of a furnace imposes few designing problems. The best compromise for durability, appearance, and economy is sheet steel. THERMOLYNE furnaces have a heavy gauge sheet case protected by an attractive heat resisting enamel.

There are many styles and arrangements of furnace doors, and each has its advantages. THERMOLYNE engineers have developed and patented two excellent door mechanisms which seal the chamber tightly and open easily. They have the unique feature of always keeping the hot side away from the operator for safety and comfort. On the larger furnaces the lower portion of the door may be opened for limited access to the chamber or inspection of the load while the top portion stays closed to prevent excessive heat loss.

Power input to the furnace must be regulated to control chamber temperatures. The controller is the basic power regulating device, but because most controllers handle relatively small amperage, a contactor or load carrying relay is required for larger furnaces.

There are two common controller types—controlled input and automatic controllers. Input controls maintain temperature by establishing equilibrium between the heat losses from the furnace and power input. The furnace assumes the temperature where heat loss is equal to the power input. A high input means high temperature and low input stabilizes at lower temperature. These controls can give very good results if closely supervised, BUT a short period of neglect can result in ruined work or burned-out heating elements. If a high input setting is left on the control the chamber temperature will keep rising toward the theoretical equilibrium point. If this



point is higher than the element wires can stand they melt and fail. In order to do useful work, heat fast, and recover chamber temperatures quickly, most furnaces have a much larger input than that necessary to maintain temperature; thus if a high percentage of the total available power is applied to an idling or pre-heated furnace, temperature will climb rapidly. The furnace may overheat in a comparatively short time.

Automatic control is undoubtedly the better solution to the control problem for most, if not all, uses. Almost all automatic controls for the temperature range of interest here are actuated by thermocouples. The thermocouple senses the chamber temperature and signals the controller by an electrical output of a magnitude related to the temperature. The control instrument is designed to react to the thermocouple signal and regulate the power input.

The simplest form of automatic control is the on-off control where power is supplied to the heating elements when the temperature measured by the thermocouple is below the set temperature and turned off when the chamber temperature is equal to or above the set value. This can give very good control where the thermocouple can immediately sense any change in heating element temperatures; however, most furnaces have appreciable lags between the heating elements and thermocouple with the result that the actual chamber temperature is "ahead" of the reported temperature. This causes an initial "over-shoot" and oscillation about the set point. Where actual temperatures are not critical, this type of control works very well.

In order to overcome the effects of thermal lag in a furnace simple proportioning is usually incorporated in the control instrument. Proportioning gives an input which is proportional to the difference between the set temperature and the actual temperature. The most popular form of proportioning is time proportioning where power to the furnace is rhythmically pulsed, the average power input being determined by the "duty cycle". This is the fraction of the total time that power is "on". Proportioning tends to eliminate initial over-shoot and minimize temperature oscillation. It is preferred where the furnace will be operated near the top limit of its elements and where uniform temperatures are important.

It is important to understand that a furnace and its controller are two parts of a system, and that the performance of the system as a whole is really the goal of the user. If the two units are each compatible with the desired results, the system probably will be satisfactory; if either part is unwisely chosen the system will be disappointing.

Factors to consider in choosing a furnace and controller are: temperature capability, accuracy, furnace capacity (volume), heating time, and recovery time.

**TEMPERATURE CAPABILITY** is the economical top operating temperature. Most furnaces can be heated beyond their rated limits, but the heating elements are severely damaged by doing so. Life is approximately halved for each 50°C temperature rise. Most manufacturers rate their furnaces for a maximum operating temperature where elements will give an acceptable service life under normal conditions. (As the manufacturer has no control over actual use conditions and harmful practices, including heating of known deleterious substances, none will guarantee any specific minimum life. All manufacturers recognize heating elements as expendable parts where eventual failure is expected.)

**ACCURACY** may be defined as the difference between the temperature of an object placed in the furnace and the temperature for which the controller is set when the furnace has reached equilibrium. It includes several variables including: the chamber gradient, thermocouple error, controller error, repeatability, and transient errors from other causes. As accuracy is really a complex of several factors, each of the major factors deserves attention.

The chamber gradient is caused by lack of radiating surfaces all around the object. Doors and backs of furnaces usually do not have heating elements, so the parts of the chamber near these surfaces are not heated as much as the central zone. The central half to two-thirds of the chamber are considered the most uniformly heated portion. The shape of this uniform zone depends on the size and shape of the chamber, the size and location of the heating elements, and insulation efficiency. This gradient factor is present in all common furnaces, and may be as much as 25 to 50°C from the center to the door or rear wall. To avoid these extremes, the user should have a furnace large enough to allow only the central uniform zone to be used for work requiring precision.

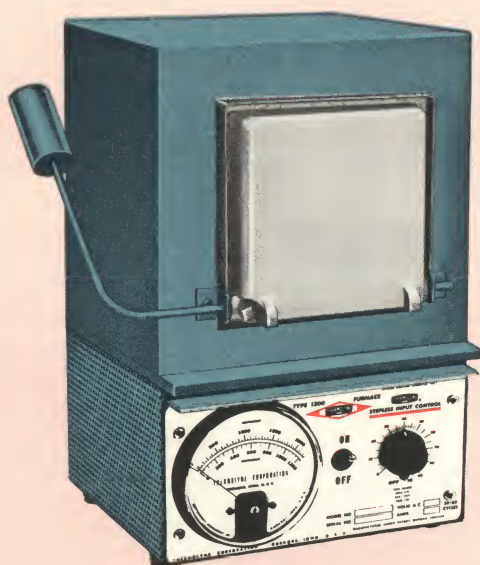
The two thermocouple types most commonly used are chromel/alumel and platinum/platinum 13% rhodium. The output of these thermocouples is not linear, and can vary with the individual alloy melt. The alloy manufacturers guarantee an accuracy of  $\frac{3}{4}\%$  for chromel/alumel and  $\frac{1}{2}\%$  for platinum thermocouples. This means that the output of a given chromel/alumel thermocouple will be within  $\frac{3}{4}\%$  of the theoretical output of a standard thermocouple of that type at any specific temperature. (It may be *above* or *below* the standard, giving a total error range of  $1\frac{1}{2}\%$ . For instance where a standard thermocouple might indicate 1000°C, an acceptable stock thermocouple might indicate from 992.5°C to 1007.5°C.) If this tolerance is not acceptable on your job, specially tested and certified thermocouples with the exact output at given temperatures noted must be purchased. Thermocouples age and their output can be influenced by alloy changes when they are heated near their useful limits. Only new thermocouples should be used for critical work.

Controller accuracy is usually stated as a percent of the scale range of the instrument, and varies from  $\frac{1}{4}\%$  to 2%, with the cost and type of controller. It depends upon how close the scale of the instrument follows the standard output curve of the type of thermocouple it is calibrated for. An instrument with 1% accuracy reading to 1000°C may be 10°C above or below the standard curve at any point along the scale and still meet specifications. Greater accuracy may be obtained at extra cost, or a given instrument can be checked against a standard and its deviations recorded and applied to its settings. (Thermocouple error and control error are cumulative.)

Repeatability is perhaps more important than pure accuracy, as known error possibilities can be compensated for by setting changes. Most furnaces and control systems repeat a temperature cycle much closer than the permitted deviations from standard conditions. Thus if extremely accurate temperatures are actually not too important but duplication of circumstances is, the same setting can be made and the apparatus will respond with quite good results. If standard conditions must be met, thermocouple error and controller error can be compensated for by setting changes.



# ELECTRIC FURNACES TYPES 1300 & 1400



## CHECK THESE FEATURES:

### HEATS FAST

Reaches 1600°F in approximately 40 minutes — Plenty of reserve power — Quick recovery with large loads.

Maximum Operating Temperature:  
1900°F (1038°C)

### LOW COST

Reasonable initial cost — Efficient use of power for low operating expense — Real value in service per dollar.

### LONG LIFE

Simple, rugged components, high grade materials, and straight forward design for dependable performance — Sturdy steel case — Ventilated control section keeps controls cool — Efficient insulation — Built to work hard and stay on the job — Heating elements embedded in special refractory cement for protection.

### HANDY TO USE

Furnace is complete, easily portable, plugs into any outlet — Use anywhere, bench and table tops stay cool — Counter-balanced door forms loading shelf — All controls easily seen and grouped for convenience.

### TROUBLE FREE

High quality standards, rigid manufacturing control, and thorough testing of each unit before shipment assure high customer satisfaction — All repairs and adjustments are easily made by the user if ever necessary with minimum cost and delay.

### ACCURATE CONTROL

Manually adjusted percentage timer—Operator can select any input rate from 5% to 100% of full rated input — Furnace will stabilize at temperature matching input — Control prevents drift, compensate for voltage fluctuations, ambient temperature changes — Fully stepless patented control unit allows operator to adjust furnace to hold any working temperature within close limits.

### DEPENDABLE TEMPERATURE INDICATION

Accurate, double scale, full view pyrometer constantly shows chamber temperature. Meter coil resistance is thermistor compensated for ambient temperature variations.

MODEL NO.	ELECTRICAL DATA			CHAMBER SIZE			OVERALL SIZE			WEIGHT		PRICE
	Volts	Amps	Watts	W	H	D	W*	H*	D	Net	Ship	
<b>F-A1310M</b>	240	4.4	1050	4	3¾	4½	8	12½	8½	16	23	<b>\$80.00</b>
<b>F-A1315M</b>	120	8.8	1050	4	3¾	4½	8	12½	8½	16	23	<b>80.00</b>
<b>F-A1318M</b>	208	5.0	1050	4	3¾	4½	8	12½	8½	16	23	<b>80.00</b>
<b>F-A1410M</b>	240	6.3	1510	4⅞	4¼	6	10	14½	11	27	33	<b>98.50</b>
<b>F-A1415M</b>	120	12.6	1510	4⅞	4¼	6	10	14½	11	27	33	<b>98.50</b>
<b>F-A1418M</b>	208	7.2	1510	4⅞	4¼	6	10	14½	11	27	33	<b>98.50</b>

All prices are FAIR TRADE MINIMUM prices, F.O.B. shipping point, subject to change without notice.

\*Does not include door handle.

Type 1300 and 1400 furnaces will operate satisfactorily on the appropriate voltage 50 or 60 cycle AC.



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THERMOLYNE CORPORATION

DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.



# ELECTRIC FURNACES TYPES 1500 & 2000

## LAB-ACCEPTED STANDARD OF QUALITY

Customer's choice of many variables to suit his specific need — Automatic electronic control for accuracy, freedom from supervision; manual control for economy—Size, temperature range, and voltage options for wide selection freedom—One of these combinations ideal for most users; pick the one most advantageous for your work.

**ELECTRONIC CONTROL** Automatic feed-back potentiometer type — User sets desired temperature on the dial, control heats furnace to set temperature and holds it within very close limits—Full power heats fast until setting is reached, then cycles as needed to hold—Minimum initial overshoot—Simple, sure, control.

**MANUAL CONTROL** is percentage timer type—Electrothermally operated, thoroughly reliable—Automatically corrects for voltage or ambient temperature changes—Delivers set percentage of rated input, furnace stabilizes at a given temperature for each setting—Pyrometer makes required operator supervision easy.

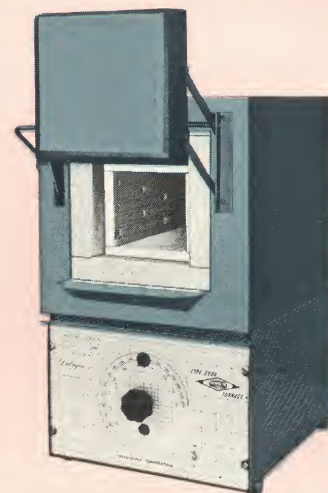
## LOOK AT THESE STANDOUT FEATURES

**HEAT FAST** Reach 1600°F in approximately 40 minutes; higher temperatures at comparable rate—Plenty of reserve power—Quick recovery with large loads.

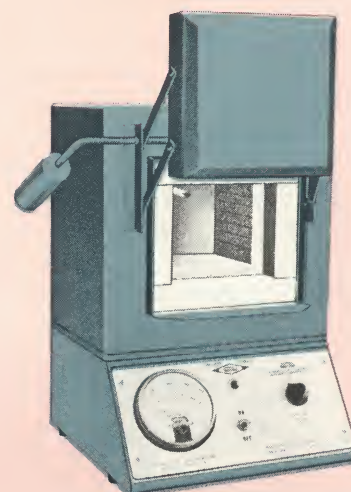
**LOW COST** Reasonable initial cost—Efficient use of power for low operating expense—Real value in service per dollar.

**LONG LIFE** Simple, rugged components, high grade materials, and straight forward design for dependable performance—Sturdy steel case—Ventilated control section keeps controls cool—Efficient insulation—Built to work hard and stay on the job—Heating elements embedded in special refractory cement for protection.

**TROUBLE FREE** High quality standards, rigid manufacturing control, and thorough testing of each unit before shipment assures high customer satisfaction—All repairs and adjustments are easily made by the user, if ever necessary with minimum cost and delay.



**AUTOMATIC CONTROL  
TYPE 2000**



**MANUAL CONTROL  
TYPE 1500**

	ELECTRICAL DATA			CHAMBER SIZE			OVERALL SIZE			OPERATING TEMPERATURE	WEIGHT		PRICE
MODEL NO.	Volts	Amps	Watts	W	H	D	W*	H*	D		Net	Ship	
AUTOMATIC CONTROL													
F-A2020P	240	9.3	2240	4	3¼	9	11	18½	16	2000°F (1093°C)	60	70	\$247.50
F-A2025P	120	18.6	2240	4	3¼	9	11	18½	16	2000°F (1093°C)	60	70	247.50
F-A2028P	208	10.8	2240	4	3¼	9	11	18½	16	2000°F (1093°C)	60	70	247.50
F-A2020P-1	240	9.3	2240	4	3¼	9	11	18½	16	2150°F (1177°C)	60	70	257.50
F-A2025P-1	120	18.6	2240	4	3¼	9	11	18½	16	2150°F (1177°C)	60	70	257.50
F-A2028P-1	208	10.8	2240	4	3¼	9	11	18½	16	2150°F (1177°C)	60	70	257.50
MANUAL CONTROL													
F-C1510M	240	6.3	1510	4	3¼	4½	11	16½	13½	2000°F (1093°C)	41	50	145.00
F-C1515M	120	12.6	1510	4	3¼	4½	11	16½	13½	2000°F (1093°C)	41	50	145.00
F-C1518M	208	7.2	1510	4	3¼	4½	11	16½	13½	2000°F (1093°C)	41	50	145.00
F-C1510M-1	240	6.3	1510	4	3¼	4½	11	16½	13½	2150°F (1177°C)	41	50	155.00
F-C1515M-1	120	12.6	1510	4	3¼	4½	11	16½	13½	2150°F (1177°C)	41	50	155.00
F-C1518M-1	208	7.2	1510	4	3¼	4½	11	16½	13½	2150°F (1177°C)	41	50	155.00
F-C1520M	240	9.3	2240	4	3¼	9	11	16½	18	2000°F (1093°C)	55	67	155.00
F-C1525M	120	18.6	2240	4	3¼	9	11	16½	18	2000°F (1093°C)	55	67	155.00
F-C1528M	208	10.8	2240	4	3¼	9	11	16½	18	2000°F (1093°C)	55	67	155.00
F-C1520M-1	240	9.3	2240	4	3¼	9	11	16½	18	2150°F (1177°C)	55	67	165.00
F-C1525M-1	120	18.6	2240	4	3¼	9	11	16½	18	2150°F (1177°C)	55	67	165.00
F-C1528M-1	208	10.8	2240	4	3¼	9	11	16½	18	2150°F (1177°C)	55	67	165.00

Type 1500 furnaces will operate satisfactorily on the appropriate voltage 50 or 60 cycles AC. Type 2000 available for 50 cycles on special order. Add \$10.00

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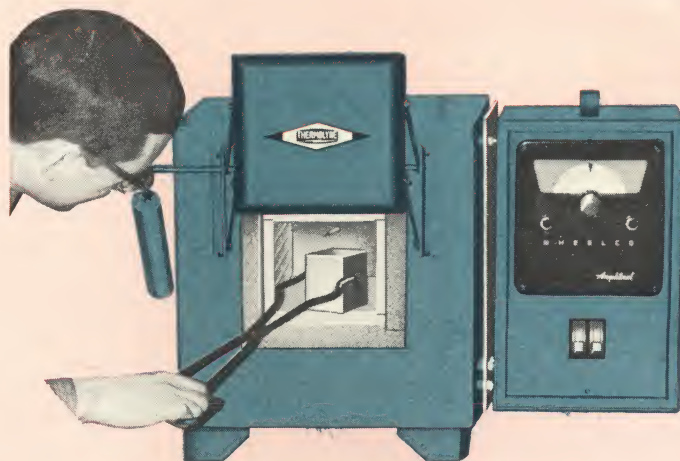
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# ELECTRIC FURNACE TYPE 1600

FOR :

LABORATORY —  
PROCESS CONTROL —  
HEAT-TREATING —  
PRODUCTION —



Type 1600 furnaces are offered in two chamber sizes, see dimensional drawing for specific dimensions. Those appearing in black are for the **F-A162**-models, and those appearing in red are for the **F-A163**-models. Dimensions on front view apply to all models.

Patented close sealing safety door swings up and out, keeping hot side away from the operator.

Two temperature ranges are available.

Standard temperature range 2000°F (1093°C) max.

High temperature range 2150°F (1177°C) max.

The high temperature models are designed by "-1" as a suffix to the model number in the table.

Type 1600 Furnaces are recommended and successfully used for a wide variety of applications. As the control requirements for these applications vary so much, a selection of optional controls is offered. Brief description of controls available appear on these pages. For complete information and aid in selecting a suitable control, refer to the general furnace information and general control information sections of this catalog.

## CONTROL CABINET ASSEMBLIES AVAILABLE FOR TYPE 1600 FURNACES

The Control Cabinet Assembly contains the control instrument of the customer's choice mounted in a steel case with all necessary contactors, circuit breakers, switches, terminal blocks,

etc. completely wired internally, ready to connect to power line and furnace. To order, specify furnace with Control Cabinet Assembly and control instrument desired.

### DUBUQUE II CONTROLLER



A compact, fully automatic electronic controller — Never needs standardizing — User sets desired operating temperature on the dial, control brings furnace up to set temperature and holds it —

One universal model, quickly converted for 120, 208, or 240 volts operation in the field by very simple connection changes, no different parts required—5°F temperature change at thermocouple tip actuates control. Uses Chromel/Alumel thermocouple, scale range 0-2200°F, 0-1200°C.

### AMPLITROL CONTROLLER



A fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it. Rugged, uses no moving

parts—Approximately 5°F temperature change at thermocouple tip will actuate on-off controls — (Thermal lag will give greater chamber variation) Proportioning controls compensate for lag to give practically straight line temperature, minimize overshoot—See AMPLITROL page for details.

Scale ranges available:

0 - 2000°F, 0 - 1095°C C/A\*;  
0 - 2400°F, 0 - 1300°C C/A#.

### DUBUQUE III CONTROLLER



A compact, fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it—Pro-

portioning circuit limits overshoot, gives practically straight-line temperature at thermocouple tip. Cold junction compensation and thermocouple break protection for accuracy and safety. See DUBUQUE III page for details. Scale ranges available:

0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F, 0 - 1095°C C/A\*;  
0 - 2500°F, 0 - 1375°C C/A#.

\* Furnished as standard for standard temperature furnace models unless otherwise specified.

# Furnished as standard for high temperature furnace models unless otherwise specified.



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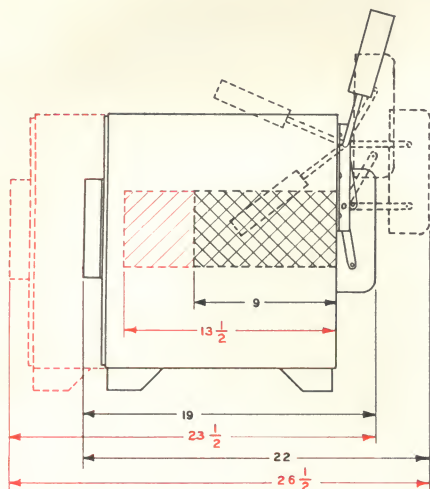


## TEMCOMETER CONTROLLER



A manually adjusted percentage timer input controller — User sets pointer to desired percentage of normal full input. Control then functions to cycle power on and off in rhythmic pulses. Percent of time "on" to total time cycle is closely held. Furnace will stabilize at a temperature corresponding to percentage of total input. Pyrometer indicates chamber temperature for guidance of the operator only. Does not actuate control. See TEMCOMETER page for details.

Pyrometer Scales Available: 0 - 800°F, 430°C C/A;  
0 - 1600°F, 0 - 870°C C/A; 0 - 2250°F, 0 - 1230°C C/A\*

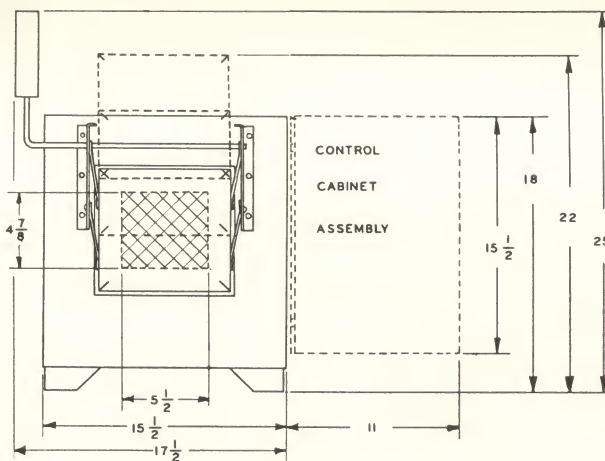


Black Dimensions Apply to F-A162- Models. (Chamber size  $5\frac{1}{2} \times 4\frac{7}{8} \times 9$ )  
Red Dimensions Apply to F-A163- Models. (Chamber size  $5\frac{1}{2} \times 4\frac{7}{8} \times 13\frac{1}{2}$ )

## CAPACITROL CONTROLLER



Completely automatic electronic control — Millivoltmeter type — User sets operating temperature on the dial, control brings furnace up to temperature and holds it. Approximately 5°F temperature change at the thermocouple tip will actuate on-off controls. (Thermal lag between heating element and tip will give greater chamber variation.) Proportioning controls compensate for lag to give practically straightline temperature at thermocouple tip. Control indicates chamber temperature at all times. See CAPACITROL page for details.  
Scale Ranges Available: 0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F, 0 - 1095°C C/A\*; 0 - 2500°F, 0 - 1375°C C/A#



SPECIFICATIONS											PRICE					
Furnace Model Number	ELECTRICAL DATA			CHAMBER SIZE			WEIGHT		Maximum Operating Temperature	Thermocouple	Furnace Only	With Temcometer Cont'l. Cabinet Assembly	With Dubuque II Control	With Amplitrol Cont'l. Cabinet Assembly	With Dubuque III Control	With Capacitrol Cont'l. Cabinet Assembly
	Volts	Amps	Watts	H	W	D	Net	Ship.								
F-A1620	240	12.5	3000	4 $\frac{7}{8}$	5 $\frac{1}{2}$	9	120	140	2000°F (1093°C)	C/A	\$157.50	\$310.50	\$342.50	\$377.50	\$387.50	\$440.75
F-A1625	120	25.0	3000	4 $\frac{7}{8}$	5 $\frac{1}{2}$	9	120	140	2000°F (1093°C)	C/A	157.50	310.50	*****	377.50	387.50	440.75
F-A1628	208	14.4	3000	4 $\frac{7}{8}$	5 $\frac{1}{2}$	9	120	140	2000°F (1093°C)	C/A	157.50	310.50	342.50	*****	387.50	440.75
F-A1630	240	17.0	4100	4 $\frac{7}{8}$	5 $\frac{1}{2}$	13 $\frac{1}{2}$	145	170	2000°F (1093°C)	C/A	177.50	330.50	362.50	397.50	407.50	460.75
F-A1635	120	34.0	4100	4 $\frac{7}{8}$	5 $\frac{1}{2}$	13 $\frac{1}{2}$	145	170	2000°F (1093°C)	C/A	177.50	330.50	*****	397.50	407.50	460.75
F-A1638	208	19.7	4100	4 $\frac{7}{8}$	5 $\frac{1}{2}$	13 $\frac{1}{2}$	145	170	2000°F (1093°C)	C/A	177.50	330.50	362.50	*****	407.50	460.75
F-A1620-1*	240	12.5	3000	4 $\frac{7}{8}$	5 $\frac{1}{2}$	9	120	140	2150°F (1177°C)	C/A	172.50	*****	*****	402.50	402.50	465.75
F-A1625-1*	120	25.0	3000	4 $\frac{7}{8}$	5 $\frac{1}{2}$	9	120	140	2150°F (1177°C)	C/A	172.50	*****	*****	402.50	402.50	465.75
F-A1628-1*	208	14.4	3000	4 $\frac{7}{8}$	5 $\frac{1}{2}$	9	120	140	2150°F (1177°C)	C/A	172.50	*****	*****	402.50	402.50	465.75
F-A1630-1*	240	17.0	4100	4 $\frac{7}{8}$	5 $\frac{1}{2}$	13 $\frac{1}{2}$	145	170	2150°F (1177°C)	C/A	192.50	*****	*****	422.50	422.50	485.75
F-A1635-1*	120	34.0	4100	4 $\frac{7}{8}$	5 $\frac{1}{2}$	13 $\frac{1}{2}$	145	170	2150°F (1177°C)	C/A	192.50	*****	*****	422.50	422.50	485.75
F-A1638-1*	208	19.7	4100	4 $\frac{7}{8}$	5 $\frac{1}{2}$	13 $\frac{1}{2}$	145	170	2150°F (1177°C)	C/A	192.50	*****	*****	422.50	422.50	485.75

\*Proportioning control required for -1 models; included in table price.

Weight of furnace alone. Add 32 lbs. for control Cabinet Assembly shipping weight.

All Prices Are FAIR TRADE MINIMUM Prices, F.O.B. Shipping Point; Subject to Change Without Notice.

† Type 1600 furnaces will operate satisfactory on 120 or 240 volts 25, 50 or 60 cycle single phase AC 120 or 240 volts DC. The controller chosen may require a specific AC frequency. See control section for details.

## TO ORDER

Specify furnace by model number; control (if desired) from information below.

1. TEMCOMETER Control Cabinet Assembly and
  - A. Scale range
- or 2. DUBUQUE II Controller
- or 3. AMPLITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range
- or 4. DUBUQUE III Controller and
  - A. Scale range. (Proportioning standard, included on all models.)
- or 5. CAPACITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range
  - C. Thermocouple. Types in table are standard.
- and 6. Length of connecting cable from control to furnace.  
Connecting Kit consisting of power lines, flexible conduit, thermocouple extension wires, and connectors sufficient to reach 4 feet labelled and ready to connect is supplied as standard and included in price of Control Cabinet Assembly in the table. For additional length add \$1.25 for each foot in excess of 4 feet.



# ELECTRIC FURNACE TYPE 1700

## LARGE BENCH-TYPE FURNACE HEAT-TREATS CARBON AND HIGH- CHROME STEEL PARTS — MEETS HEAVY-DUTY LAB REQUIREMENTS

Type 1700 furnaces are offered in two chamber sizes, see dimensional drawing for specific dimensions. Those appearing in black are for the **F-A173**-models, and those appearing in red are for the **F-A174**-models. Dimensions on front view apply to all models.

Two temperature ranges are available.

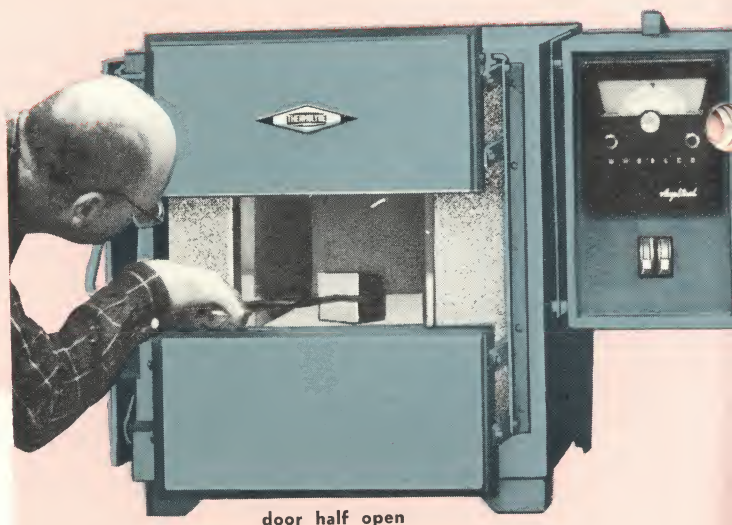
Standard temperature range 2000°F (1093°C) max.

High temperature range 2150°F (1177°C) max.

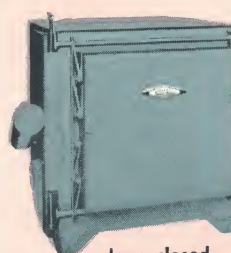
The high temperature models are designed by "-1" as a suffix to the model number in the table.

Patented close sealing sectional door.

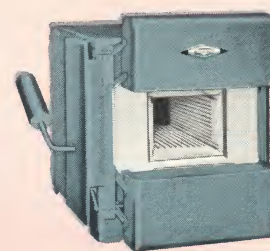
Lower section opens for chamber access or inspection while top stays closed to conserve heat energy. Further movement of handle opens top section for full chamber access.



door half open



door closed



door fully open

## CONTROL CABINET ASSEMBLIES AVAILABLE FOR TYPE 1700 FURNACES

### TEMCOMETER CONTROLLER



A manually adjusted percentage timer input controller — User sets pointer to desired percentage of normal full input. Control then functions to cycle power on and off in rhythmic pulses. Percent of time "on" to total time cycle is closely held. Furnace will stabilize at a temperature corresponding to percentage of total input. Pyrometer indicates chamber temperature for guidance of the operator only. Does not actuate control. See TEMCOMETER page for details.

Pyrometer Scales Available: 0 - 800°F, 430°C C/A; 0 - 1600°F, 0 - 870°C C/A; 0 - 2250°F, 0 - 1230°C C/A\*



### AMPLITROL CONTROLLER

A fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it — Rugged, uses no moving parts — Approximately 5°F temperature change at thermocouple tip will actuate on-off controls — (Thermal lag will give greater chamber variation.) Proportioning controls compensate for lag to give practically straight line temperature, minimize overshoot — See AMPLITROL page for details.

Scale ranges available. 0 - 2000°F, 0 - 1095°C C/A\*; 0 - 2400°F, 0 - 1300°C C/A#.



### DUBUQUE III CONTROLLER

A compact, fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and hold it—Proportioning circuit limits overshoot, gives practically straight-line temperature at thermocouple tip. Cold junction compensation and thermocouple break protection for accuracy and safety. DUBUQUE III page for details.

Scale ranges available: 0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F, 0 - 1095°C C/A\*; 0 - 2500°F, 0 - 1375°C C/A#.



### CAPACITROL CONTROLLER

Completely automatic electronic control— Millivoltmeter type — User sets operating temperature on the dial, control brings furnace up to temperature and holds it. Approximately 5°F temperature change at the thermocouple tip will actuate on-off controls. (Thermal lag between heating element and tip will give greater chamber variation.) Proportioning controls compensate for lag to give practically straightline temperature at thermocouple tip. Control indicates chamber temperature at all times. See CAPACITROL page for details.

Scale Ranges Available: 0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F, 0 - 1095°C C/A\*; 0 - 2500°F, 0 - 1375°C C/A#

\* Furnished as standard for standard temperature furnace models unless otherwise specified.

#Furnished as standard for high temperature furnace models unless otherwise specified.



LABORATORY APPARATUS

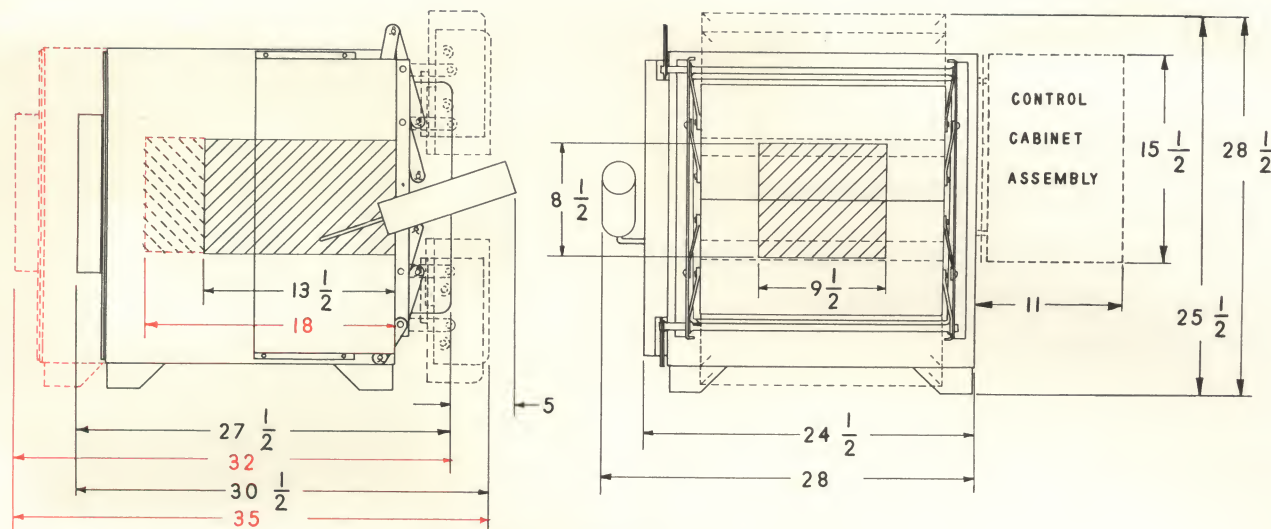
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DUBUQUE, IOWA, U.S.A.

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Black Dimensions Apply to F-A173- Models (Chamber size  $8\frac{1}{2} \times 9\frac{1}{2} \times 13\frac{1}{2}$ )

Red Dimensions Apply to F-A174- Models (Chamber size  $8\frac{1}{2} \times 9\frac{1}{2} \times 18$ )

SPECIFICATIONS										PRICE					
Furnace Model Number	ELECTRICAL DATA			CHAMBER SIZE			WEIGHT		Maximum Operating Temperature	Thermo-couple	Furnace Only	With Temcometer Cont'l. Cabinet Assembly	With Amplitrol Cont'l. Cabinet Assembly	With 4 Dubuque III Control	With Capitrol Cont'l. Cabinet Assembly
	Volts	Amps	Watts	H	W	D	Net	Ship.							
F-A1730	240	24.0	5800	8½	9½	13½	402	470	2000°F (1093°C)	C/A	310.00	463.00	530.00	540.00	593.25
F-A1738	208	27.7	5800	8½	9½	13½	402	470	2000°F (1093°C)	C/A	310.00	463.00	*****	540.00	593.25
F-A1740	240	33.0	7900	8½	9½	18	485	535	2000°F (1093°C)	C/A	360.00	513.00	580.00	590.00	643.25
F-A1748	208	33.0	6900	8½	9½	18	485	535	2000°F (1093°C)	C/A	360.00	513.00	*****	590.00	643.25
F-A1730-1*	240	24.0	5800	8½	9½	13½	402	470	2150°F (1177°C)	C/A	332.00	*****	562.00	562.00	625.25
F-A1738-1*	208	27.7	5800	8½	9½	13½	402	470	2150°F (1177°C)	C/A	332.00	*****	*****	562.00	625.25
F-A1740-1*	240	33.0	7900	8½	9½	18	485	535	2150°F (1177°C)	C/A	382.00	*****	612.00	612.00	675.25
F-A1748-1*	208	33.0	6900	8½	9½	18	485	535	2150°F (1177°C)	C/A	382.00	*****	*****	612.00	675.25

\*Proportioning control required for -1 models; included in table price.

Weight of furnace alone. Add 32 lbs. for control Cabinet Assembly shipping weight.

All Prices Are FAIR TRADE MINIMUM Prices, F.O.B. Shipping Point; Subject to Change Without Notice.

† Type 1700 furnaces will operate satisfactory on 120 or 240 volts 25, 50 or 60 cycle single phase AC 120 or 240 volts DC. The controller chosen may require a specific AC frequency. See control section for details.

## TO ORDER

Specify furnace by model number; control (if desired) from information below.

1. TEMCOMETER Control Cabinet Assembly and
  - A. Scale range
- or 2. AMPLITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range
- or 3. DUBUQUE III Controller and
  - A. Scale range. (Proportioning standard, included on all models.)
- or 4. CAPACITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range
  - C. Thermocouple. Types in table are standard.

and 5. Length of connecting cable from control to furnace.

Connecting Kit consisting of power lines, flexible conduit, thermocouple extension wires, and connectors sufficient to reach 4 feet labelled and ready to connect is supplied as standard and included in price of Control Cabinet Assembly in the table. For additional length add \$1.25 for each foot in excess of 4 feet.

Fused silicon carbide shelf fits into grooves in side elements. Greatly increases capacity where load of small parts cannot be stacked.

Order PH42X1 \_\_\_\_\_ \$9.50

( $\frac{1}{2} \times 9\frac{1}{2} \times 11$ ) Wt. 5 lbs.



Refractory hearth tray keeps load off bottom element and promotes even heating. One to four may be used at a time.

PHX1 \$1.50

4" wide,  $3\frac{1}{4}$ " long,  $\frac{1}{2}$ " high

PHX2 2.50

$3\frac{3}{8}$ " wide, 8" long,  $\frac{3}{4}$ " high





# ELECTRIC FURNACE TYPE 1800

## NEW DEVELOPMENTS MARK TYPE 1800

**CLOSE-SEALING SECTIONAL DOOR WITH PATENTED  
LEVER SUSPENSION**

**LONG-LIFE EASILY REPLACEABLE HEATING ELEMENTS**

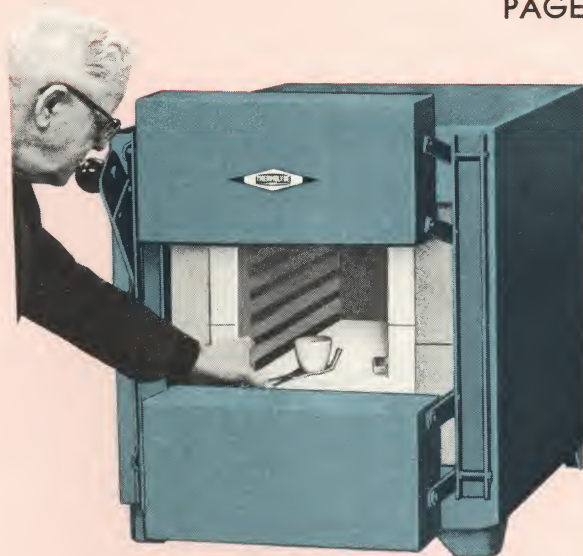
**REINFORCED WELDED STEEL CONSTRUCTION**

**SCIENTIFICALLY INSULATED**

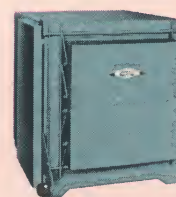
Two temperature ranges of Type 1800 furnace are available. The STANDARD range is to a maximum of 2000°F (1093°C) continuous duty. A Chromel/Alumel thermocouple is used and included in the price of the furnace.

The HIGH TEMPERATURE range is to a maximum of 2300°F (1260°C) continuous duty. A platinum/platinum 13% rhodium thermocouple is required to operate at top temperature, and must be ordered separately. (See ordering instructions.)

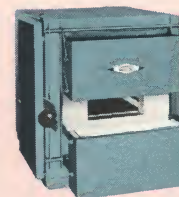
A proportioning type control instrument is needed to operate either temperature range furnace near the maximum temperature. Proportioning controls greatly reduce temperature overshoot which may cause premature element failure.



Door Fully Open



Door Closed



Door Half Open

## CONTROL CABINET ASSEMBLIES AVAILABLE FOR TYPE 1800 FURNACES

The Control Cabinet Assembly contains the control instrument of the customer's choice mounted in a steel case with all necessary contactors, circuit breakers, switches, terminal blocks,

etc. completely wired internally, ready to connect to power line and furnace. To order, specify furnace with Control Cabinet Assembly and control instrument desired.

### DUBUQUE III CONTROLLER



A compact, fully automatic electronic controller—Never needs standardizing—User sets operating temperature on the dial, control brings furnace up to set temperature and holds it—Proportioning

circuit limits overshoot, gives practically straight-line temperature at thermocouple tip. Cold junction compensation and thermocouple break protection for accuracy and safety. DUBUQUE III page for details.

Scale ranges available:

0 - 1200°F, 0 - 650°C C/A;  
0 - 2000°F, 0 - 1095°C C/A\*  
0 - 2500°F, 0 - 1375°C C/A#

### AMPLITROL CONTROLLER



A fully automatic electronic controller—Never needs standardizing—User sets operating temperature on the dial, control brings furnace up to set temperature and holds it—Rugged, uses no moving parts—Approximately 5°F tempera-

ture change at thermocouple tip will actuate on-off controls—(Thermal lag will give greater chamber variations.) Proportioning controls compensate for lag to give practically straight line temperature, minimize overshoot — See AMPLITROL page for details.

Scale ranges available:

0 - 2000°F, 0 - 1095°C C/A\*;  
0 - 2400°F, 0 - 1300°C C/A#

### CAPACITROL CONTROLLER



Completely automatic electronic control — Milivoltmeter type — User sets operating temperature on the dial, Control brings furnace up to temperature and holds it. Approximately 5°F tem-

perature change at the thermocouple tip will actuate on-off controls. (Thermal lag between heating element and tip will give greater chamber variations.) Proportioning controls compensate for lag to give practically straight-line temperature at thermocouple tip. Control indicates chamber temperature at all times. See CAPACITROL page for details.

Scale ranges available:

0 - 1200°F, 0 - 650°C C/A  
0 - 2000°F, 0 - 1095°C C/A\*  
0 - 2500°F, 0 - 1375°C C/A  
0 - 2500°F, 0 - 1375°C Pt/Pt. 13% Rh

\* Furnished as standard for standard temperature furnace models unless otherwise specified.

#Furnished as standard for high temperature furnace models unless otherwise specified.



LABORATORY APPARATUS

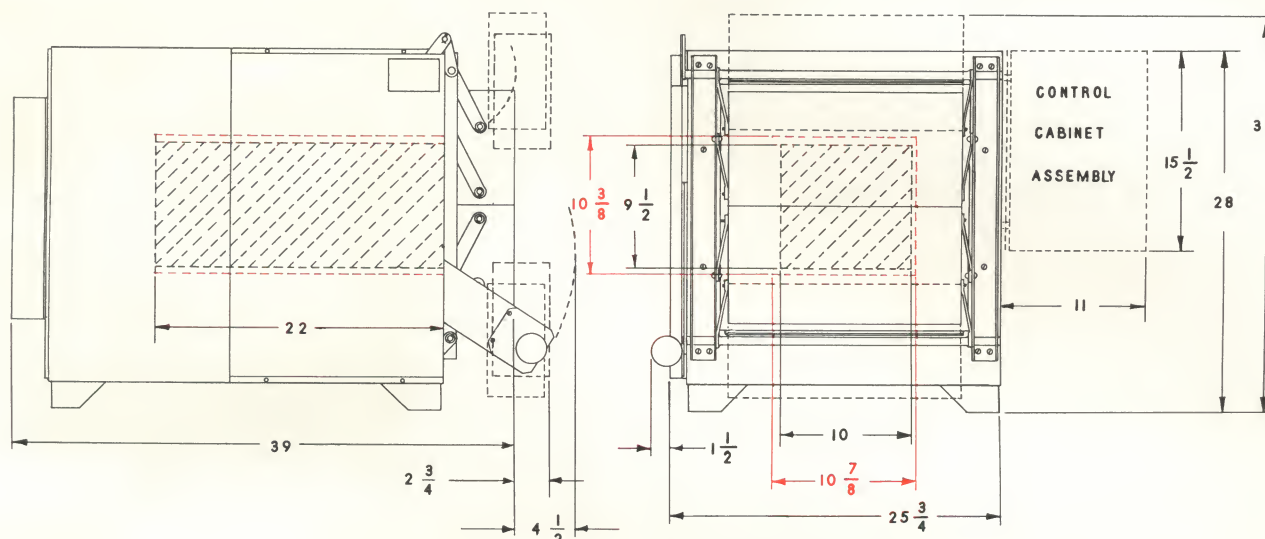
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Black dimensions apply to models F-1850, F-1850-1, 3F-1850, 3F-1850-1, 3F-1858, 3F-1858-1.  
(Chamber size  $9\frac{1}{2} \times 10 \times 22$ )

Red dimensions apply to model 3F-1852, 3F-1852-1, 3F-1856, 3F-1856-1. (Chamber size  $10\frac{3}{8} \times 10\frac{7}{8} \times 22$ )

This chamber size difference is not a customer option, but a function of construction.

SPECIFICATIONS												PRICE			
Furnace Model Number	ELECTRICAL DATA				CHAMBER SIZE			WEIGHT		Maximum Operating Temperature	Thermo-couple	Furnace Only	With Amplitrol Cont'l. Cabinet Assembly	With 1 Dubuque III Control	With Capacitrol Cont'l. Cabinet Assembly
	Volts	Phase	Amps	Watts	H	W	D	Net	Ship.						
F-1850	240	1	52.0	12,500	$9\frac{1}{2}$	10	22	695	790	2000°F (1093°C)	C/A	\$685.00	\$925.00	\$915.00	\$ 988.25
F-1850-1*	240	1	52.0	12,500	$9\frac{1}{2}$	10	22	695	790	2300°F (1260°C)	Pt/Pt 13% Rho	730.00	*****	*****	1,111.75
3F-1850	240	3	29.7	12,400	$9\frac{1}{2}$	10	22	695	790	2000°F (1093°C)	C/A	700.00	940.00	930.00	1,003.25
3F-1850-1*	240	3	30.2	12,600	$9\frac{1}{2}$	10	22	695	790	2300°F (1260°C)	Pt/Pt 13% Rho	745.00	*****	*****	1,126.75
3F-1852	400-420	3	16.4	11,900	10%	10%	22	695	790	2000°F (1093°C)	C/A	750.00	1,011.50	980.00	1,074.75
3F-1852-1*	400-420	3	16.4	11,900	10%	10%	22	695	790	2300°F (1260°C)	Pt/Pt 13% Rho	795.00	*****	*****	1,198.25
3F-1856	480	3	17.0	14,100	10%	10%	22	695	790	2000°F (1093°C)	C/A	750.00	1,011.50	980.00	1,074.75
3F-1856-1*	480	3	17.0	14,100	10%	10%	22	695	790	2300°F (1260°C)	Pt/Pt 13% Rho	795.00	*****	*****	1,198.25
3F-1858	208	3	31.2	11,300	$9\frac{1}{2}$	10	22	695	790	2000°F (1093°C)	C/A	700.00	*****	930.00	1,003.25
3F-1858-1*	208	3	31.2	11,300	$9\frac{1}{2}$	10	22	695	790	2300°F (1260°C)	Pt/Pt 13% Rho	745.00	*****	*****	1,126.75

\*-1 prices include Pt/Pt 13% Rho TC for operation above 2000°F except FURNACE ONLY, add \$68.50.

\*Proportioning control required for -1 models; included in table price.

Weight of furnace alone. Add 32 lbs. for control Cabinet Assembly shipping weight.

All Prices Are FAIR TRADE MINIMUM Prices, F.O.B. Shipping Point; Subject to Change Without Notice.

Models 3F-1856 and 3F-1856-1 require a separate 120 volts circuit for operation of the controller.

## TO ORDER:

Specify furnace by model number; control (if desired) from information below.

1. DUBUQUE III Controller and
  - A. Scale range (Proportioning standard, included on all models.)
- or
2. AMPLITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range.
- or
3. CAPACITROL Control Cabinet and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range.
  - C. Thermocouple. Types in table are standard.
- and
4. Length of connecting cable from control to furnace.

Connecting Kit consisting of power lines, flexible conduit, thermocouple extension wires, and connectors sufficient to reach 4 feet labeled and ready to connect is supplied as standard and included in price of Control Cabinet Assembly in the table. For additional length add \$1.25 for each foot in excess of 4 feet.



# ELECTRIC FURNACE TYPE 1900

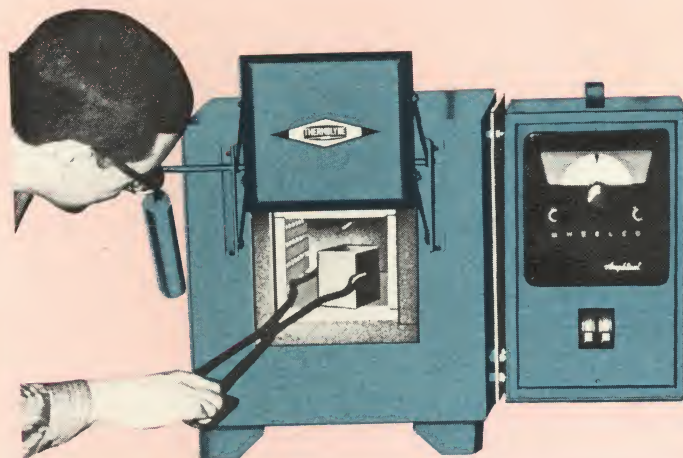
## COMPACT VERSATILE BENCH TYPE ELECTRIC FURNACES FOR LABORATORY OR SHOP

Two temperature ranges of Type 1900 furnace are available. The STANDARD range is to a maximum of 2000°F (1093°C) continuous duty. A Chromel/Alumel thermocouple is used and included in the price of the furnace.

The HIGH TEMPERATURE range is to a maximum of 2300°F (1260°C) continuous duty. A platinum/platinum 13% rhodium thermocouple is required to operate at top temperature, and must be ordered separately. (See ordering instructions.)

A proportioning type control instrument is needed to operate either temperature range furnace near the maximum temperature. Proportioning controls greatly reduce temperature overshoot which may cause premature element failure.

Patented close sealing safety door swings up and out, keeping hot side away from the operator.



Type 1900 Furnaces are recommended and successfully used for a wide variety of applications. As the control requirements for these applications vary so much, a selection of optional controls is offered. Brief description of controls available appear on these pages. For complete information and aid in selecting a suitable control, refer to the general furnace information and general control information sections of this catalog.

## CONTROL CABINET ASSEMBLIES AVAILABLE FOR TYPE 1900 FURNACES

The Control Cabinet Assembly contains the control instrument of the customer's choice mounted in a steel case with all necessary contactors, circuit breakers, switches, terminal blocks,

etc. completely wired internally, ready to connect to power line and furnace. To order, specify furnace with Control Cabinet Assembly and control instrument desired.

### DUBUQUE II CONTROLLER



A compact, fully automatic electronic controller — Never needs standardizing — User sets desired operating temperature on the dial, control brings furnace up to set temperature and holds it —

One universal model, quickly converted for 120, 208, or 240 volts operation in the field by very simple connection changes, no different parts required — 5°F temperature change at thermocouple tip actuates control. Uses Chromel/Alumel thermocouple, scale range 0-2200°F, 0-1200°C.

### AMPLITROL CONTROLLER



A fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it. Rugged, uses no moving

parts — Approximately 5°F temperature change at thermocouple tip will actuate on-off controls — (Thermal lag will give greater chamber variation) Proportioning controls compensate for lag to give practically straight line temperature, minimize overshoot — See AMPLITROL page for details.

Scale ranges available:

0 - 2000°F, 0 - 1095°C C/A\*;  
0 - 2400°F, 0 - 1300°C C/A#.

### DUBUQUE III CONTROLLER



A compact, fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it — Pro-

portioning circuit limits overshoot, gives practically straight-line temperature at thermocouple tip. Cold junction compensation and thermocouple break protection for accuracy and safety. See DUBUQUE III page for details. Scale ranges available:

0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F  
0 - 1095°C C/A\*; 0 - 2500°F, 0 - 1375°C/A#.

\* Furnished as standard for standard temperature furnace models unless otherwise specified.  
# Furnished as standard for high temperature furnace models unless otherwise specified.



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## TEMCOMETER CONTROLLER



A manually adjusted percentage timer input controller — User sets pointer to desired percentage of normal full input. Control then functions to cycle power on and off in rhythmic pulses. Percent of time "on" to total time cycle is closely held. Furnace will stabilize at a temperature corresponding to percentage of total input. Pyrometer indicates chamber temperature for guidance of the operator only. Does not actuate control. See TEMCOMETER page for details.

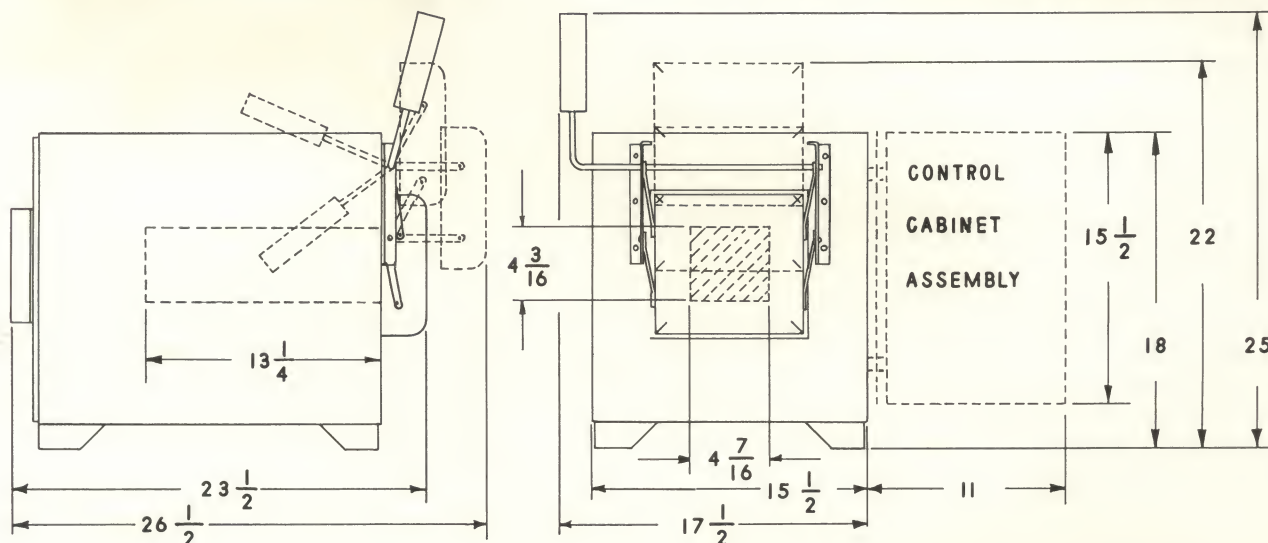
Pyrometer Scales Available: 0 - 800°F, 430°C C/A;  
0 - 1600°F, 0 - 870°C C/A; 0 - 2250°F, 0 - 1230°C C/A\*

## CAPACITROL CONTROLLER



Completely automatic electronic control — Millivoltmeter type — User sets operating temperature on the dial, control brings furnace up to temperature and holds it. Approximately 5°F temperature change at the thermocouple tip will actuate on-off controls. (Thermal lag between heating element and tip will give greater chamber variation.) Proportioning controls compensate for lag to give practically straightline temperature at thermocouple tip. Control indicates chamber temperature at all times. See CAPACITROL page for details.

Scale Ranges Available: 0 - 1200°F, 0 - 650° C C/A; 0 - 2000°F,  
0 - 1095°C C/A\*; 0 - 2500°F, 0 - 1375°C C/A#  
0 - 2500°F, 0 - 1375°C Pt/Pt. 13% Rho



SPECIFICATIONS											PRICE						
Furnace Model Number	ELECTRICAL DATA			CHAMBER SIZE			WEIGHT		Maximum Operating Temperature	Thermo-couple	Furnace Only	With Temcometer Cont'l. Cabinet Assembly	With Dubuque II Control	With Amplitrol Cont'l. Cabinet Assembly	With Dubuque III Control	With Capacitrol Cont'l. Cabinet Assembly	
	Volts	Amps	Watts	H	W	D	Net	Ship.									
F-1930	240	17.0	4100	4 3/8	4 3/8	13 1/4	177	200	2000°F (1093°C)	C/A	\$215.00	\$368.00	\$400.00	\$435.00	\$445.00	\$498.25	
F-1930-1*	240	17.0	4100	4 3/8	4 3/8	13 1/4	177	200	2300°F (1260°C)	Pt/Pt 13% Rho	235.00	*****	*****	*****	*****	596.75	
F-1935	120	34.0	4100	4 3/8	4 3/8	13 1/4	177	200	2000°F (1093°C)	C/A	215.00	368.00	*****	435.00	445.00	498.25	
F-1935-1*	120	34.0	4100	4 3/8	4 3/8	13 1/4	177	200	2300°F (1260°C)	Pt/Pt 13% Rho	235.00	*****	*****	*****	*****	596.75	
F-1938	208	19.3	4000	4 3/8	4 3/8	13 1/4	177	200	2000°F (1093°C)	C/A	215.00	368.00	400.00	*****	445.00	498.25	
F-1938-1*	208	19.3	4000	4 3/8	4 3/8	13 1/4	177	200	2300°F (1260°C)	Pt/Pt 13% Rho	235.00	*****	*****	*****	*****	596.75	

\*-1 prices include Pt/Pt 13% Rho TC for operation above 2000°F except FURNACE ONLY, add \$68.50.

\*Proportioning control required for -1 models; included in table price.

Weight of furnace alone. Add 32 lbs. for control Cabinet Assembly shipping weight.

All Prices Are FAIR TRADE MINIMUM Prices, F.O.B. Shipping Point; Subject to Change Without Notice.

† Type 1900 furnaces will operate satisfactory on 120 or 240 volts 25, 50 or 60 cycle single phase AC 120 or 240 volts DC. The controller chosen may require a specific AC frequency. See control section for details.

### TO ORDER

Specify furnace by model number; control (if desired) from information below.

1. TEMCOMETER Control Cabinet Assembly and
  - A. Scale range
- or 2. DUBUQUE II Controller
- or 3. AMPLITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range
- or 4. DUBUQUE III Controller and
  - A. Scale range. (Proportioning standard, included on all models.)
- or 5. CAPACITROL Control Cabinet Assembly and
  - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
  - B. Scale range
  - C. Thermocouple. Types in table are standard.
- and 6. Length of connecting cable from control to furnace.  
Connecting Kit consisting of power lines, flexible conduit, thermocouple extension wires, and connectors sufficient to reach 4 feet labelled and ready to connect is supplied as standard and included in price of Control Cabinet Assembly in the table. For additional length add \$1.25 for each foot in excess of 4 feet.



# ELECTRIC FURNACE TYPE 6000

## HEATING ELEMENTS IN ALL SIX SIDES!!

### A FURNACE FOR MANY USES:

#### CLINICAL:

PBI ignitions easy with Type 6000; large 80 tube capacity, close temperature control, uniform chamber temperature. Drying and ignition of biological specimens, sterilization of glassware and instruments, preparation of oxalate tubes, etc.

#### GENERAL LABS

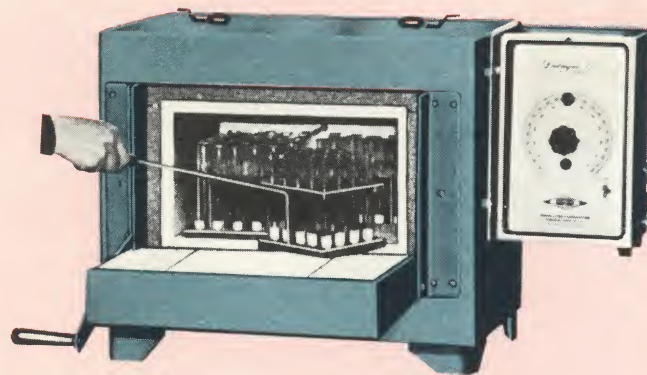
Dries precipitates, glassware, instruments; General ignition and fusion procedures are quick and easy.

#### PROCESS CONTROL:

Reliable, durable unit for day-after-day quality control tests in food, fuel, waste disposal, and chemical processing.

#### HEAT TREATING:

Close temperature control, large chamber, and six element uniformity ideal for annealing, hardening, sintering, brazing, and austempering. Economically handles production heat treating of small parts or short runs.



For PBI test tube racks and handle shown see page 31

Type 6000 Furnaces are recommended and successfully used for a wide variety of applications. As the control requirements for these applications vary so much, a selection of optional controls is offered. Brief description of controls available appear on these pages. For complete information and aid in selecting a suitable control, refer to the general furnace information and general control information sections of this catalog.

## CONTROL CABINET ASSEMBLIES AVAILABLE FOR TYPE 6000 FURNACES

The Control Cabinet Assembly contains the control instrument of the customer's choice mounted in a steel case with all necessary contactors, circuit breakers, switches, terminal blocks,

etc. completely wired internally, ready to connect to power line and furnace. To order, specify furnace with Control Cabinet Assembly and control instrument desired.

### DUBUQUE II CONTROLLER



A compact, fully automatic electronic controller — Never needs standardizing — User sets desired operating temperature on the dial, control brings furnace up to set temperature and holds it —

One universal model, quickly converted for 120, 208, or 240 volts operation in the field by very simple connection changes, no different parts required — 5°F temperature change at thermocouple tip actuates control. Uses Chromel/Alumel thermocouple, scale range 0-2200°F, 0-1200°C.

### AMPLITROL CONTROLLER



A fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it. Rugged, uses no moving

parts — Approximately 5°F temperature change at thermocouple tip will actuate on-off controls — (Thermal lag will give greater chamber variation) Proportioning controls compensate for lag to give practically straight line temperature, minimize overshoot — See AMPLITROL page for details.

Scale ranges available:

0 - 2000°F, 0 - 1095°C C/A

### DUBUQUE III CONTROLLER



A compact, fully automatic electronic controller — Never needs standardizing — User sets operating temperature on the dial, control brings furnace up to set temperature and holds it — Pro-

portioning circuit limits overshoot, gives practically straight-line temperature at thermocouple tip. Cold junction compensation and thermocouple break protection for accuracy and safety. See DUBUQUE III page for details. Scale ranges available:

0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F, 0 - 1095°C C/A



LABORATORY APPARATUS

SCIENTIFICALLY ENGINEERED  
CAREFULLY MANUFACTURED  
PROPERLY PRICED

THERMOLYNE CORPORATION

DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.



## TEMCOMETER CONTROLLER



A manually adjusted percentage timer input controller — User sets pointer to desired percentage of normal full input. Control then functions to cycle power on and off in rhythmic pulses. Percent of time "on" to total time cycle is closely held. Furnace will stabilize at a temperature corresponding to percentage of total input. Pyrometer indicates chamber temperature for guidance of the operator only. Does not actuate control. See TEMCOMETER page for details.

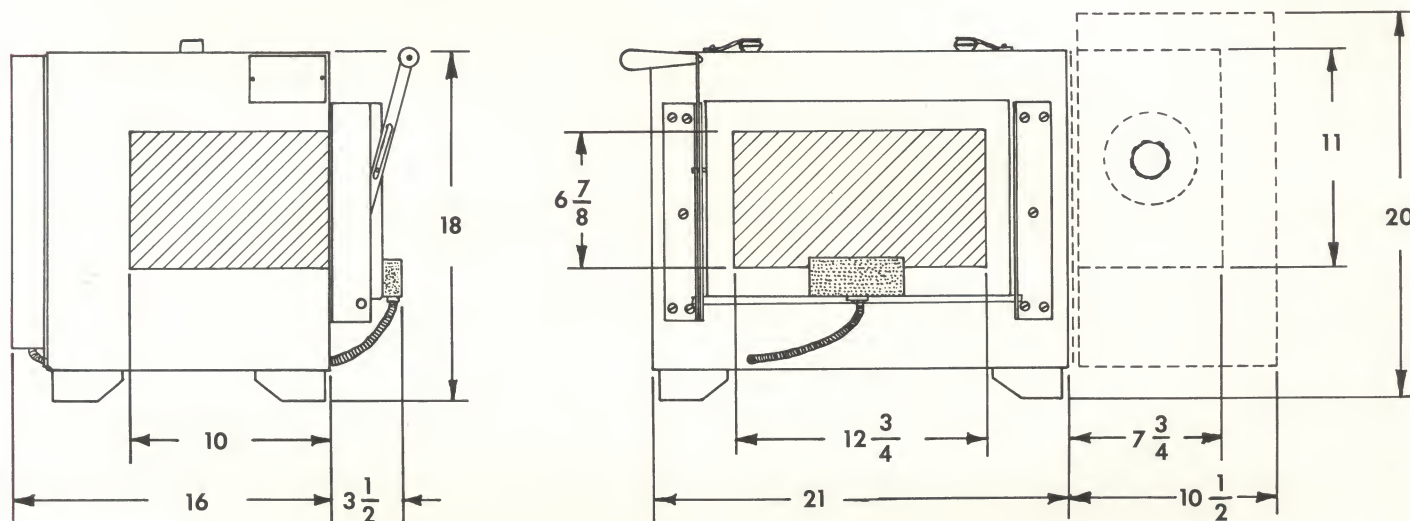
Pyrometer Scales Available: 0 - 800°F, 430°C C/A;  
0 - 1600°F, 0 - 870°C C/A; 0 - 2250°F, 0 - 1230°C C/A

## CAPACITROL CONTROLLER



Completely automatic electronic control — Millivoltmeter type — User sets operating temperature on the dial, control brings furnace up to temperature and holds it. Approximately 5°F temperature change at the thermocouple tip will actuate on-off controls. (Thermal lag between heating element and tip will give greater chamber variation.) Proportioning controls compensate for lag to give practically straightline temperature at thermocouple tip. Control indicates chamber temperature at all times. See CAPACITROL page for details.

Scale Ranges Available: 0 - 1200°F, 0 - 650°C C/A; 0 - 2000°F,  
0 - 1095°C C/A ; 0 - 2500°F, 0 - 1375°C C/A



SPECIFICATIONS											PRICE					
Furnace Model Number	ELECTRICAL DATA			CHAMBER SIZE			WEIGHT		Maximum Operating Temperature	Thermo-couple	Furnace Only	With Temcometer Cont'l. Cabinet Assembly	With Dubuque II Control	With Amplitrol Cont'l. Cabinet Assembly	With 4 Dubuque III Control	With Capacitrol Cont'l. Cabinet Assembly
	Volts	Amps	Watts	H	W	D	Net	Ship.								
F-6020	240	17.0	4080	6 7/8	12 3/4	10	150	185	1900°F (1038°C)	C/A	\$310.00	\$463.00	\$495.00	\$530.00	\$540.00	\$593.25
F-6025	120	34.0	4080	6 7/8	12 3/4	10	150	185	1900°F (1038°C)	C/A	310.00	463.00	495.00	530.00	540.00	593.25
F-6028	208	19.6	4080	6 7/8	12 3/4	10	150	185	1900°F (1038°C)	C/A	310.00	463.00	495.00	*****	540.00	593.25

Weight of furnace alone. Add 32 lbs. for control Cabinet Assembly shipping weight.

All Prices Are FAIR TRADE MINIMUM Prices, F.O.B. Shipping Point; Subject to Change Without Notice.

\* Type 6000 furnaces will operate satisfactory on 120 or 240 volts 25, 50 or 60 cycle single phase AC 120 or 240 volts DC. The controller chosen may require a specific AC frequency. See control section for details.

## TO ORDER

Specify furnace by model number; control (if desired) from information below.

1. TEMCOMETER Control Cabinet Assembly and
    - A. Scale range
  - or 2. DUBUQUE II Controller
  - or 3. AMPLITROL Control Cabinet Assembly and
    - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
    - B. Scale range
  - or 4. DUBUQUE III Controller and
    - A. Scale range. (Proportioning standard, included on all models.)
  - or 5. CAPACITROL Control Cabinet Assembly and
    - A. Proportioning or on-off (Add \$10.00 for proportioning except where noted.)
    - B. Scale range
    - C. Thermocouple. Types in table are standard.
  - and 6. Length of connecting cable from control to furnace.
- Connecting Kit consisting of power lines, flexible conduit, thermocouple extension wires, and connectors sufficient to reach 4 feet labelled and ready to connect is supplied as standard and included in price of Control Cabinet Assembly in the table. For additional length add \$1.25 for each foot in excess of 4 feet.



# CONTROLS FOR ELECTRIC FURNACES

Two basic types of temperature controllers are offered in this section:

- (1) Fully Automatic, and
- (2) Manually Adjusted Percentage Timers.

The automatic type controls are recommended for most furnaces because they eliminate human error or neglect which can so easily result in burned out heating elements. Manually adjusted controls are satisfactory where low cost is of primary importance, and where the operating attendant can be relied upon to give close attention to their operation.

The fully automatic temperature controllers are further divided into two types:

- (1) Electronic Potentiometer (Dubuque II, Dubuque III, and Amplitrol)
- (2) Electronic Millivoltmeter (Capacitrol)

With all controllers there is a "lag" factor between the application of energy to the heating elements and control response. In many cases this lag is not of great importance, and straight "on-off" controls function satisfactorily, though there is an initial overshoot and cycling of temperatures about the control point. Where overshoot and temperature variations are objectionable, an optional proportioning circuit which functions to "anticipate" temperature changes in the controlled apparatus is recommended. This proportioning circuit greatly suppresses initial overshoot and gives practically "straight-line" temperature control.

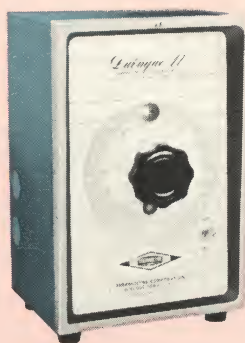
Cold junction compensation corrects for ambient temperature at the cold junction of the thermocouple. This allows a control to hold true temperatures in the controlled apparatus. It also functions to hold chamber temperatures even despite ambient temperature changes.

## AUTOMATIC ELECTRONIC POTENTIOMETER TEMPERATURE CONTROLLERS (Dubuque II, Dubuque III, And Amplitrol)

These controls are simple, rugged, and have no moving parts (except the relay or contactor points); therefore they function well under adverse conditions of dust, vibration, fumes, etc. They all operate by simply setting the control dial at the desired operating temperature. Setting the dial selects a calibrated voltage corresponding to the output of a thermocouple at that temperature. This voltage is connected in series with and opposed to the output of a thermocouple in

the apparatus to be controlled. These two voltages are fed into a saturable reactor which immediately detects any difference between them and fires a thyatron to open or close the power relay as needed to maintain the temperature set on the dial. This type of control allows full power to be utilized for fast heat up and then cycles power as needed to maintain temperatures.

### DUBUQUE II CONTROLLER



A low cost electronic controller for use with smaller furnaces. Will control within close limits. Complete with a very usable power rating; all necessary components built in. May be mounted on the side of a furnace (all hardware supplied) or on a bench or post near furnace. Long life and accuracy at economy price.

One model fits all needs, easily changed in the field by user for operation on 120, 208, or 240 volts. No parts required, simple connection changes convert voltage.

### SPECIFICATIONS

**THERMOCOUPLE BREAK PROTECTION,**  
(Proportioning or cold junction compensation not available on Dubuque II)

**SENSITIVITY:** 75 microvolts (Approximately 3°F)

**ACCURACY OF DIAL SETTING:** 1% of scale range

**CONTACT RATINGS:** 20 amperes, non-inductive.

**POWER SUPPLY:** 120, 208, or 240 volts 60 cycle AC single phase. (May be calibrated for 50 cycles for \$10.00 additional charge.)

**DIMENSIONS:** 11" high, 7¼" wide, 6⅛" deep.

**WEIGHTS:** Net, 8¾ lbs.; Shipping, 18 lbs.

**SCALE:** Double scale, reads direct,  
100° to 2200°F, 0° to 1200°C

**THERMOCOUPLE:** Chromel/Alumel

Price includes connecting kit of flexible cable, thermocouple extension wires, power wires, all connecting hardware, etc. with terminals marked, ready to connect control to furnace. Kit will reach 4 feet. Additional length available at time of order for \$1.25 per foot in excess of 4 feet.

Order THERMOLYNE DUBUQUE II CONTROLLER, specify voltage to be connected.

MODEL CP-7300

PRICE \$185.00



LABORATORY APPARATUS

SCIENTIFICALLY ENGINEERED  
CAREFULLY MANUFACTURED  
PROPERLY PRICED

THERMOLYNE CORPORATION

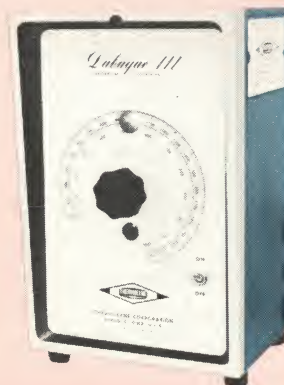
DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.



## DUBUQUE III CONTROLLER

This is a deluxe potentiometer temperature controller, complete in one package. Ideal for laboratory, shop, or school use. Power circuit matched to needs of customer—A "custom" controller at stock prices—includes all features which aid critical temperature control. Easy to install, operate, and maintain. May be mounted on side of furnace (all hardware supplied) or on bench or post near furnace.



## SPECIFICATIONS:

**THERMOCOUPLE BREAK PROTECTION** standard

**COLD JUNCTION COMPENSATION** standard

**PROPORTIONING** standard

**SENSITIVITY:** 75 microvolts (approximately 3°F all scales)

**ACCURACY OF DIAL SETTING:** 1% of scale range

**CONTACT RATINGS:** As specified by customer up to 480 volts 3 phase or single phase 35 amps max. (If ordered with a THERMOLYNE furnace will be matched to furnace specs. If ordered for other apparatus, please supply current specifications: voltage, phase, cycles, 35 amps maximum.

**POWER SUPPLY:** 120, 208, or 240 volts 60 cycles AC required for controller. (May be calibrated for 50 cycles for \$10.00 additional charge.)

**DIMENSIONS:** 11" high, 7¼" wide, 6⅛" deep.

**WEIGHTS:** Net, 9½ lbs.; shipping, 19 lbs.

**STANDARD SCALE RANGES:** double scales for chromel/alumel thermocouples.

0° to 800°F, 0° to 425°C;

0° to 2000°F, 0° to 1095°C;

0° to 2400°F, 0° to 1300°C;

Price includes connecting kit of flexible cable, thermocouple extension wires, power wires, all connecting hardware, etc. with terminals marked, ready to connect control to furnace. Kit will reach 4 feet. Additoinal length available at time fo order for \$1.25 per foot in excess fo 4 feet.

Order THERMOLYNE DUBUQUE III CONTROLLER, specify power supply or apparatus specifications.  
PRICE \$230.00

## AMPLITROL CONTROLLER



## SPECIFICATIONS: MODEL 151

**THERMOCOUPLE BREAK PROTECTION** standard

**COLD JUNCTION COMPENSATION** standard

**SENSITIVITY:** 75 microvolts (approximately 3°F all scales)

**ACCURACY OF DIAL SETTING:** 1% of scale range

**CONTACT RATING:** 6 amperes at 120 volts  
3 amperes at 240 volts

**POWER SUPPLY:** 120 or 240 volts 60 cycles single phase AC (May be calibrated for 50 cycles for \$10.00 additional charge.)

**DIMENSIONS:** 8½" high, 7⅝" wide, 7-25/32" deep

**WEIGHTS:** Net 7 lbs.; shipping 11 lbs.

**STANDARD SCALE RANGES:** Double scales for chromel/alumel thermocouples.

0° to 800°F, 0° to 425°C;

0° to 2000°F, 0° to 1095°C;

0° to 2400°F, 0° to 1300°C;

PRICE, MODEL 151 \$130.00

This controller is designed for panel mounting, and consists of the control instrument alone. It may be purchased separately, or installed in a Control Cabinet Assembly. Manufactured by Barber-Coleman under THERMOLYNE patent license. A sensitive, accurate controller, yet rugged in service, simple to install and use. Holds temperatures within very close limits. Excellent for remote control installations.

## SPECIFICATIONS: MODEL 152

Same as above, but add:

**PROPORTIONING FEATURE INCLUDED**

**PROPORTIONING BAND WIDTH:** 1% of scale range

**CYCLE TIME:** fixed, 18 seconds.

PRICE, MODEL 152 \$140.00

(Write for other scales or thermocouple calibrations available.)

Order AMPLITROL CONTROLLER, specify model, voltage and scale.

**Note:**—Because of the small current capacity a contactor is necessary to operate any but the smallest loads. Refer to the accessory listings at the end of this section for prices.



## ELECTRONIC MILLIVOLTMETER TEMPERATURE CONTROLLERS (CAPACITROL)

This type of controller is used where constant and accurate temperature indication on the instrument scale is desired. The CAPACITROL consists of two sections: a sensitive galvanometer pyrometer and an electronic control chassis. Setting a pointer on the control dial positions a pair of pick-up coils of a tuned oscillator circuit. When a small metallic flag carried by the temperature indicating arm of

the pyrometer moves between the coils it changes the frequency of the circuit. The CAPACITROL is tuned to operate a power relay to turn off power to the controlled apparatus when the temperature indicating needle lines up with the setting pointer. Power is turned back on when the indicator needle falls below the setting pointer.

### CAPACITROL CONTROLLER



#### SPECIFICATIONS: MODEL 292

**THERMOCOUPLE BREAK PROTECTION:** Standard  
**COLD JUNCTION COMPENSATION:** Standard  
**SCALE length:** 5 inches  
**SENSITIVITY:** .006" needle travel (Varies with scale range)

**ACCURACY OF DIAL SETTING:** 1% of scale range  
**CONTACT RATINGS:** 5 amperes at 120 volts  
 3 amperes at 240 volts

**POWER SUPPLY:** 120, 208, or 240 volts, 50/60 cycles AC.  
**DIMENSIONS:** 8 1/4" high, 7 3/8" wide, 7-3/16" deep

**WEIGHTS:** net, 11 1/2 lbs.; shipping 15 lbs.

**STANDARD SCALE RANGES:** Double scales. Read directly °F or °C.

Scale	Thermocouple
0° to 1200°F, 0° to 650°C	C/A
0° to 2000°F, 0° to 1095°C	C/A
0° to 2500°F, 0° to 1375°C	C/A
0° to 2500°F, 0° to 1375°C	Pt/Pt 13% Rho

**PRICE, MODEL 292 \$193.25**

An ideal controller for use where it is important to know the temperature of controlled apparatus at all times, or where operator needs to know how far temperature is from control setting. This control is designed for panel mounting, and consists of the control only. It may be purchased separately, or mounted in a Control Cabinet Assembly. A sensitive, accurate controller; easy to install and operate.

#### SPECIFICATIONS: MODEL 293

Same as above, but add:

**PROPORTIONING FEATURE INCLUDED**

**PROPORTIONING BAND WIDTH:** Adjustable

**CYCLE TIME:** Varies with proportioning band width.

**PRICE, MODEL 293 \$203.25**

(Write for other scales or thermocouple calibrations available.)

Order **CAPACITROL CONTROLLER**, specify model, voltage, and scale.

Note:—Because of the small current carrying capacity of the control, a contactor is needed to operate any sizable load. Refer to the accessory listings at the end of this section for prices.

Accessories required when Amplitrol or Capacitrol is purchased separately (Not in a Control Cabinet Assembly).



**CONTACTOR**, heavy duty, industrial. Used to increase the capacity of a comparatively light duty control instrument. The contactor is placed between the controller and its load in the control circuit. The controller then operates the contactor which switches the current to the load on or off as signaled by the controller. Price includes box for front of panel mounting.

RY71X6A	120 Volts	Single-Phase	35 Amps	\$28.75
RY71X7A	230 Volts	Single-Phase	35 Amps	28.75
RY71X8A	230 Volts	Three-Phase	35 Amps	32.00



**CIRCUIT BREAKER SWITCH.** Used to protect an electric circuit from overload damage. The circuit breaker will open the circuit in case of overload, and can be reset after the circuit fault is corrected without hunting for new fuses or fuse elements. Supplied with two breakers mounted in a box for front of panel mounting for single-phase. Three for three-phase.

SW71X4A	Circuit Breaker 115 or 230 Volts, Single-Phase	\$14.75
	For Three-Phase	22.00

THERMOCOUPLE I/C or C/A 12" long, 14 ga., porcelain insulators	3.25
THERMOCOUPLE EXTENSION WIRES, I/C or C/A, per foot	.50
THERMOCOUPLE CONNECTION BLOCK, Bakelite	1.00



## MANUALLY ADJUSTED PERCENTAGE TIMER CONTROLLERS

(Temcometer, THERMOLYNE Stepless Input Controller Type 8000, CN56XI)

The TEMCOMETER and THERMOLYNE Stepless Input Controller Type 8000 are rugged and durable percentage timer type controls. They are used for regulating the temperature of electric furnaces, heating mantles, flask heaters, water baths, heating tapes, and similar apparatus where low cost is of primary importance, and where the attendant operator can be relied upon to give close attention to their operation.

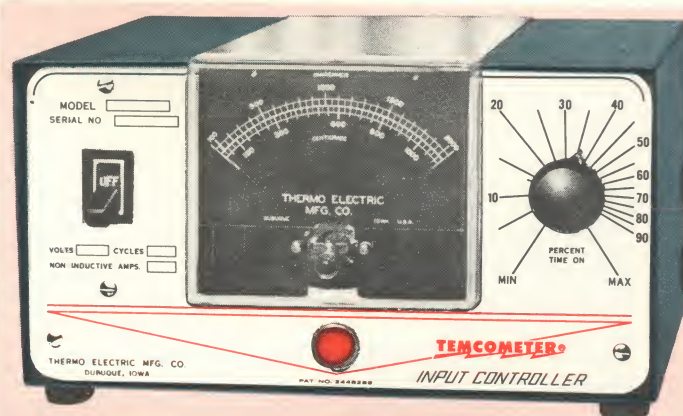
Percentage timers operate by regulating the input to the connected load. The input is divided into a series of "on" and "off" pulses. The proportion of "time on" to the total time cycle is infinitely variable from 5% to 100% "time on" in THERMOLYNE percentage timers. With experience an operator

can select the correct input to maintain any desired temperature in the connected load. The controls automatically compensate for line voltage variations and ambient temperature changes to maintain the set percentage of full rated input.

NOTE: Most electric furnaces are built with a much larger heating capacity than that needed to maintain temperatures. This "reserve power" is used for heating the load, rapid heat-up, and rapid recovery of temperature. If a manually adjusted control is set to a high input rate (more than 35%) and neglected, this reserve power can cause the furnace to overheat and burn out the heating elements.

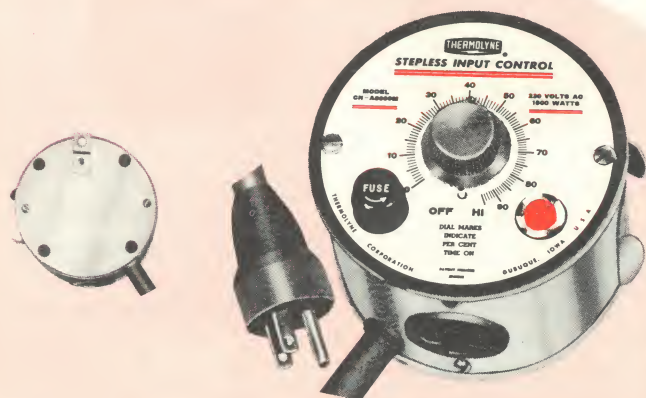
### TEMCOMETER INPUT CONTROLLER

A low cost input controller with pyrometer, line switch, and pilot light. Regulates temperature by limiting power input. Pyrometer shows temperature of controlled apparatus. Operator makes adjustments as guided by pyrometer readings. Heavy duty relay or contactor built in. Attractive bench top case, terminal strip for connections.



MODEL NUMBER	ELECTRICAL RATINGS			DIMENSIONS			WEIGHT		PRICE
	VOLTS	MAX. WATTS	NON-IND. AMPS	W	H	D	NET	SHIP.	
CP-500T	240	2880	12.0	10	5 1/4	6 1/2	7	12	\$72.50
CP-505T	120	2880	24.0	10	5 1/4	6 1/2	7	12	72.50
CP-A510T	240	7200	30	10	5 1/4	6 1/2	7	12	87.50
CP-A515T	120	4080	34	10	5 1/4	6 1/2	7	12	87.50

### THERMOLYNE STEPLESS INPUT CONTROLLER TYPE 8000

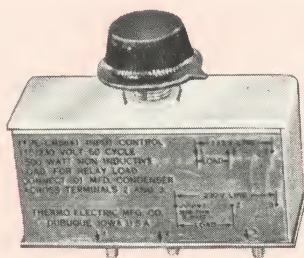


Ideal for control of heating mantles, flask heaters, heating tapes, etc. User merely plugs control into service outlet; apparatus into controller. Operates in any position, dovetail bracket and strap hanger provided. Heavy duty 3 wire cord and 3 prong plug; 3 prong receptacle for grounded safety. Pilot light glows when power supplied to load, fuse protects controller and load.

MODEL NUMBER	ELECTRICAL RATINGS				DIMENSIONS		WEIGHT		PRICE
	NON-INDUCTIVE		INDUCTIVE						
	VOLTS	AMPS	MAX. WATTS		DIA.	H	NET	SHIP.	
CN-A8000M	240	6.25	1500	125 VA	4	4	1½	2	\$18.75
CN-A8005M	120	12.5	1500	125 VA	4	4	1½	2	15.75



## PANEL MOUNTING CONTROL



Designed for panel mounting in apparatus of user's own manufacture. Supplied less knob, dial, cord, or fuse. Mounts through 13/32" hole through panel, all connections made on 3 terminals in rear. Circuit diagram on side of case.

## SPECIFICATIONS:

**CAPACITY**, 1500 watts non-inductive load, 125 VA inductive load.

**POWER SUPPLY**: 120 volts 50/60 cycles AC.  
Resistor for 240 volts, order RSX20, \$1.00.  
For inductive loads use Capacitor CAX2, \$ .50.

**DIMENSIONS**: 1 1/4" x 3 1/2"; 2 3/8" behind panel;  
Shaft 1/4" dia. x 3/4" long.

Write for sample dial and installation data.

CN56XI

\$9.50

## CONTROL CABINET ASSEMBLIES

THERMOLYNE Control Cabinet Assemblies are primarily designed to adapt AMPLITROL and CAPACITROL controllers to THERMOLYNE furnaces; however they are entirely suitable for adapting these controllers to other apparatus, including furnaces of other manufacturers. The Control Cabinet Assembly consists of a panel for mounting the controller, a suitable contactor or power relay, circuit breakers, terminal strips, etc., in an attractive steel case. The case may be mounted on the side of a furnace (all hardware is supplied), or on a bench or post near the apparatus to be controlled. It contains all items necessary to make a complete control to furnace installation, including a connecting kit of flexible conduit, power wires, thermocouple extension wires, etc. All wires have terminals installed and plainly marked for easy connection. The kit

will reach four feet; for longer lengths, specify the length needed and add \$1.25 per foot over four feet.

Four basic models of Control Cabinet Assembly are offered. Order the controller desired from the preceeding pages, and the Control Cabinet Assembly which matches the power requirements of the apparatus to be operated. The controller chosen will be installed and all internal wiring completed and tested.

**DIMENSIONS**: All models 18" high, 10" wide, 11" deep  
**WEIGHT**: With AMPLITROL installed net, 24 lbs.;  
shipping 32 lbs.

With CAPACITROL installed net, 30 lbs.;  
shipping 37 lbs.

## MODEL CPS \$90.00

Will adapt controller chosen to load requiring 120, 208, or 240 volts single phase AC using 35 amperes or less. Supplied with chromel/alumel thermocouple and connection block unless otherwise specified.

Note:—AMPLITROL controller not available for 208 volts.

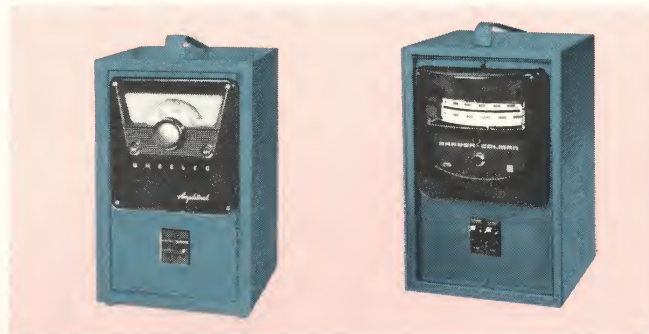
## MODEL CPT \$110.00

Will adapt controller chosen to load requiring 208 or 240 volts 60 cycle 3 phase current using less than 35 amperes. Supplied with chromel/alumel thermocouple and connection block unless otherwise specified.

Note:—AMPLITROL controller not available for 208 volts.

## MODEL CPL \$110.00

Designed to operate THERMOLYNE F-1850 furnace or similar apparatus where the load may be divided into two equal increments. Each increment is rated 240 volts, single phase 60 cycles AC, 25 amperes max. (Total load, 50 amps). A four pole contactor is used which switches both increments simultaneously. Supplied with chromel/alumel thermocouple and connection block unless otherwise specified.



## MODEL CPC \$131.50

Designed for those unusual situations where one of the Control Cabinet Assemblies listed above will not function. Requires a 120 volt 60 cycle single phase circuit to operate the controller. Power circuit may be anything up to 480 volts three phase 50 amperes maximum. (Controller may be calibrated for 50 cycles.) This Control Cabinet Assembly will adapt the controller chosen for almost any circumstance, including countries where local standards differ from American standards.

Supplied with chromel/alumel thermocouple and connection block unless otherwise specified.

NOTE:—Where controller is calibrated for platinum/platinum 13% rhodium thermocouples add \$68.50 for thermocouple and porcelain protection tube.



# ELECTRIC HOT PLATES

## GENERAL INFORMATION

A hot plate is generally considered to be a small, low cost, extremely portable device for heating material placed on it. Many types are available, and many different sources of heat energy are used, however, electric hot plates far outnumber the other heat sources. The vast number of hot plate uses have evolved several criteria for good hot plate design. Some of them are:

1. Fast heat transfer to the load,
2. Control of the heat applied,
3. Structural strength to support reasonable working loads,
4. Safety for operating personnel and surrounding apparatus,
5. Long service life,
6. Ease of maintenance and repair,
7. Simple, yet dependable controls,
8. Attractive appearance.

THERMOLYNE hot plates are built to meet all these design criteria, and excel in many of them. The paramount consideration of all THERMOLYNE products is usefulness to the owner, and each design is thoroughly tested for dependability.

Whenever there is a need for fast heating (in all hot plates this is a prime design factor) the problem of control of this heating is brought out. Fast heating requires a high energy input. It is axiomatic that high input rates are hard to control closely because of the lag factor. There is a definite time interval between the ability of a heating element to reach a specific temperature and the ability of a controlling sensor to measure and react to a temperature change. If this lag factor is great, there is a marked "overshoot" of the element temperature on a rising temperature change and a corresponding "undershoot" on a falling temperature change while the control is sensing the element temperature and reacting to it. This produces a "band" of actual surface temperatures. The width of the band is influenced by both the input rate and the sensitivity of the control.

Current designs of THERMOLYNE hot plates use a bi-metallic thermostat to control the working temperature. This demand type control allows full rated power to heat the element until the hot plate and load are brought up to the chosen temperature. Power is then cycled as needed to maintain the working temperature. This system has two distinct advantages:

1. The load is heated to the working temperature in the shortest time; *ALL* of the hot plate capacity is used when it does the most good.
2. The load itself is used to control its temperature. (If working temperatures are at all important, it is the *load* temperature that matters. All others are incidental means to the end.)

These very desirable features are furnished without sacrifice of fine control, because THERMOLYNE engineers have solved the problem of handling full input without excessive overshoot and temperature variation. They have applied several well known and proven principles of heat transfer physics in a unique manner. A bi-metallic thermostat is firmly

attached to the top plate with a planned heat flow path to it. This thermostat senses the actual working temperature, and is part of the power switch. The control is infinitely adjustable, and any temperature from a few degrees above ambient to the top operating temperature may be easily set on it. (The dial plates are marked with approximate surface temperatures for the settings.) The control has an "anticipatory" feature, and keeps overshoot and undershoot to the minimum. (Within  $\pm 2^\circ\text{F}$  with the control set at  $200^\circ\text{F}$  or above after a brief stabilization period. Slightly more below  $200^\circ\text{F}$ .) The control is mechanically simple and rugged. It is easily recalibrated, repaired, or replaced if necessary, though long life in either continuous or intermittent service is the rule.

All THERMOLYNE hot plate heating elements are embedded in a special refractory cement. This refractory has excellent heat conduction and electrical insulation qualities that make it ideal for this purpose. It was developed by THERMOLYNE engineers in cooperation with a large midwestern university after years of research. The large mass of the refractory plate acts as a "surge reservoir" to aid in damping temperature variation. Embedding the wire protects it to some degree from oxidation, chemical attack, and physical distortion. The placement of individual coils is preserved in the design location because embedding prevents "creep" and "sag". Repair is easier because installing a new element plate puts the coils where they should be with positive control and minimum trouble.

Top plates of THERMOLYNE hot plates are made from cast aluminum, cast iron, or porcelain enamelled steel. Each of these materials is used where it can contribute most to long life, high performance, and customer satisfaction. Cast aluminum distributes heat energy evenly over the entire heating surface, cast iron works where aluminum would be too soft, and steel-backed porcelain brings a glass hard chemically resistant top to those places where it is advantageous.

In the Fall of 1949 THERMOLYNE CORPORATION introduced a new concept in hot plate construction to the laboratory market. The ventilated case construction of the now famous Type 1900 hot plate solved several major problems in hot plate design. This innovation enabled the Type 1900 to have a very hot top and a cool base section in a low silhouette design. It effectively solved the problem of scorched table tops in laboratories. The natural cool air flow through the ventilated case keeps all the working controls cool, and extends their working life. Type 1900 gained wide and quick acceptance; it soon became (and still is) "America's Favorite Laboratory Hot Plate." Type 1900 has been constantly refined to keep it up to date as soon as new discoveries in hot plate construction proved changes desirable. This constant improvement of a good product, along with the development and introduction of many more sizes and models of hot plates with equal merit has enhanced THERMOLYNE CORPORATION'S reputation for production of instrument grade laboratory hot plates.



IDEAL FOR LABORATORY, OFFICE,  
CLINIC, CLASSROOM, OR SHOP

## ELECTRIC HOT PLATE TYPE 1900

### HOLDS TEMPERATURES CLOSE

Stepless thermostatic control — Infinitely variable settings — Fast heat up — Automatic voltage and ambient temperature compensation — Developed specially by Thermolyne — Holds within 5°F to 200°F (93°C) — within 2°F from 200°F to 700°F (maximum).

### DISTRIBUTES HEAT EVENLY — TABLE TOPS STAY COOL

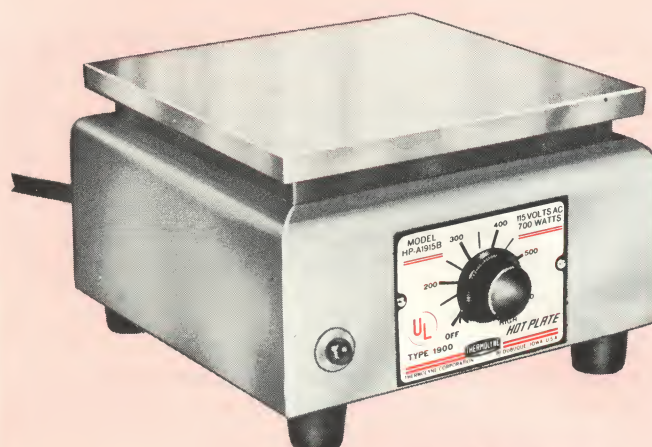
Accurate coil spacing distributes heat uniformly — Cast aluminum top stays flat — Scientific baffling directs heat up and away from controls and table tops for safety and long life.

### SAFE AND SOUND CONSTRUCTION

Entire unit Underwriters Laboratories listed — 3 wire grounded cord and plug — Stainless steel case, welded — Pilot light glows when heating.

### HANDY TO USE — GOOD LOOKING —

Double dovetail socket — Fits standard lattice set-up — Neat design, spills run off — Stainless steel resists corrosion — Phenolic feet won't scratch or stain.



"America's Favorite  
Laboratory Hot Plate"

#### TYPICAL USES:

Drying slides	Heat experiments	Boiling
Drying tissue	Heating adhesives	Distillations
Warming solutions	Infra red source	Extractions
Making solutions	Annealing glass, metals	Digestions
Fractionations	Sealing wrappers	Sterilizing
Viscosity tests	Preheating parts for shrink fit	Tempering
Moisture tests	Making coffee	Melting wax
Making agar	Heating soup	Soldering

MODEL NUMBER	ELECTRICAL RATINGS			TOP PLATE (Inches)		OVERALL SIZE (Inches)			WEIGHT (Pounds)		MAXIMUM OPERATING TEMPERATURE	PRICE
	VOLTS 50/60 CYCLE	AMPS	WATTS	W	D	W	H	D	NET	Ship		
HP-A1915B	120	6.3	750	6¼	6¼	6%	4%	7%	4½	5¼	700°F (371°C)	\$22.75
HP-A1910M	240	3.15	750	6¼	6¼	6%	4%	7%	4½	5¼	700°F (371°C)	25.75*

\* Not UL Listed.

## ELECTRIC HOT PLATE TYPE 2500

Deluxe Laboratory Hot Plate



#### TYPICAL USES:

This hot plate is good for the same uses as listed above for our Type 1900. The difference is the shape, size and appearance.

### CLOSE TEMPERATURE CONTROL

Same scientifically designed control that is used in our famous Type 1900 listed above — Fast heat up.

### MORE WORK SPACE —

#### EVEN HEAT DISTRIBUTION

Large 7" diameter cast aluminum top, MACHINED FLAT — Same accurate coil spacing as Type 1900 — Embedded heating element.

### OUTSTANDING APPEARANCE — MAXIMUM UTILITY

Satin finish aluminum body rings — Brushed stainless steel case band — Double dovetail socket for lattice set-ups.

### SOLIDLY AND SAFELY BUILT

3-wire grounded cord and plug — Stainless steel and cast aluminum case — Pilot light indicates when heat is on — Scientifically designed ventilation system keeps control and base section cool — No scorched table tops.

MODEL NUMBER	ELECTRICAL RATINGS			TOP PLATE (Inches)	OVERALL SIZE (Inches)			WEIGHT (Pounds)		MAXIMUM OPERATING TEMPERATURE	PRICE
	VOLTS 50/60 CYCLES	AMPS	WATTS		W	H	D	NET	Ship		
HP-2515B	120	6.3	750	7 Dia.	7%	4	8%	5¼	6	700°F (371°C)	\$32.50



LABORATORY APPARATUS

SCIENTIFICALLY ENGINEERED  
CAREFULLY MANUFACTURED  
PROPERLY PRICED

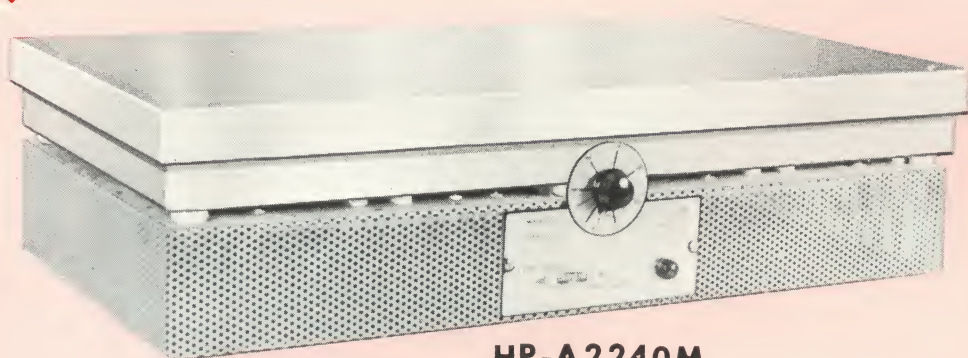
THERMOLYNE CORPORATION

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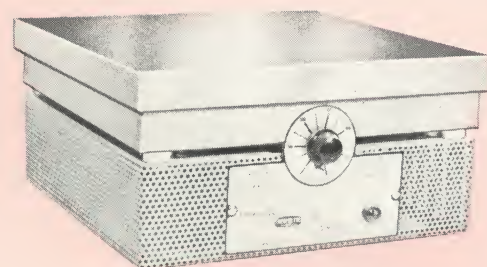
Printed in U.S.A.



# ELECTRIC HOT PLATE TYPE 2200



HP-A2240M



HP-A2230M

## TYPICAL USES

Constant temperature laboratory heating  
Evaporation Studies  
Heating of water baths  
Distillation of liquids  
Digestion of chemical samples  
Heating pressure cookers  
Controlled heating of waxes, coatings  
Soldering operations  
Refluxing steroids  
Sealing plastic film wrappings  
Soil analysis

Mounting silicon wafers, ultrasonic cuttings  
Heating plastic sheets to malleability  
Acetone extractions and distillations  
Drying aggregates  
Heating dies  
Metallurgical lab tempering  
Heating small batch bituminous paving samples  
Heating and sterilization of agar media  
Cementing lenses in optical labs  
Preheating parts for soldering  
Mounting specimens for grinding

## LARGE FLAT SURFACE WITH EVEN TEMPERATURES

Large area for big jobs or many smaller jobs simultaneously — Ideal for multiple extraction set-ups or class use by several students — Flat surface gives best heat transfer, vessels don't rock — Massive aluminum top plate casting with integral ribs and frame won't warp or buckle, conducts heat evenly to entire working surface.

## FAST, EVEN HEATING

Husky input for working power, fully utilized by scientific design — Reflective baffles backed up by thick insulation direct heat energy to top where it is used — Large mass of heating section acts as "surge reservoir", damps out temperature variations.

## SENSITIVE, ACCURATE CONTROL

Exclusive specially designed thermostat supplies full power until set temperature is reached, then cycles as needed to maintain surface temperature within  $\pm$  or  $-5^{\circ}$  of set point — Unique bi-metal with simple feed-back system

quickly and accurately senses surface temperature — "Snap action" for long contact life — Infinitely stepless choice of working temperature easily set, won't drift.

## MODERN STYLING, GOOD LOOKS

Low silhouette, clean lines — Overhanging top keeps spills out of the works — Aluminum and stainless steel easy to keep neat.

## MECHANICALLY SOUND

Sturdy case of perforated stainless steel will support heavy loads, rugged structural members for strength — Perforations allow free circulation of air in lower section, keeping the control components cool, also prevents overheating of table top — Connections easy to reach.

## EMBEDDED HEATING ELEMENT

Heating coil embedded in special refractory cement — Refractory protects coil, keeps turns in planned position, no sag or creep. Refractory developed by THERMOLYNE engineers especially for this purpose has high electrical resistivity, high heat conductivity, high strength — Makes replacement simple and accurate.

MODEL NUMBER	ELECTRICAL RATINGS			TOP PLATE (Inches)		OVERALL SIZE (Inches)			WEIGHT (Pounds)		MAXIMUM OPERATING TEMPERATURE	PRICE
	VOLTS 50/60 CYCLES	AMPS	WATTS	W	D	W	H	D	NET	Ship		
HP-A2230M	240	6.7	1600	12	12	12	6 $\frac{1}{8}$	13	17.8	25	700°F (371°C)	\$ 70.00
HP-A2235M	120	13.3	1600	12	12	12	6 $\frac{1}{8}$	13	17.8	25	700°F (371°C)	70.00
HP-A2240M	240	13.3	3200	24	12	24	6 $\frac{1}{8}$	13	37	49	700°F (371°C)	105.00
HP-A2245M	120	26.6	3200	24	12	24	6 $\frac{1}{8}$	13	37	49	700°F (371°C)	105.00



# ELECTRIC HOT PLATES TYPES 2300 and 2600



## MICRO SIZE—MACRO VALUE

A small hot plate for heating in tight places with all the high quality THERMOLYNE features.

## FAST, EVEN HEATING

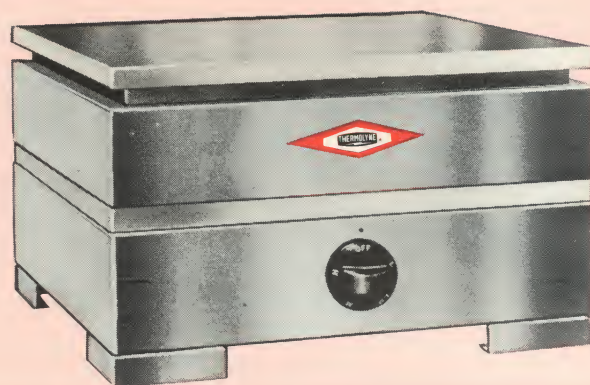
Will reach 500°F in 4½ minutes, 700°F in 7½ minutes—Puts 325 watts to work right now!! Embedded heating element applies heat evenly over whole top plate, cast aluminum heating surface distributes heat evenly—Mass of heating section damps out surges, keeps working temperatures level.

## PRECISE, STEPLESS TEMPERATURE CONTROL

Proven stepless demand type thermostat allows selection of any temperature from 10°F over ambient to 700°F (371°C)—Holds surface temperatures within + or - 3°F of set point—Easy to set, automatically corrects for ambient temperature and line voltage changes.

## SAFE, STURDY CONSTRUCTION

Perforated stainless steel case allows ventilating currents to keep control and lower section cool—Reflecting baffles direct heat to top for useful work—Can be handled with top at maximum temperature—Support rod furnished prevents turning in lattice set-ups, dovetail fits standard clamps—3 wire cord and 3 prong plug standard.



## TOUGH INDUSTRIAL HOT PLATE CAST IRON TOP PLATE

Takes knocks and bumps in stride—Machined flat for best heat transfer—Loads won't rock—Rust preventing heat resistant painted surface.

## FOUR IDEAL WORKING TEMPERATURES

Temperature is controlled by limiting input by balanced resistance combinations of two heating elements—Heavy duty 5 position switch selects input and temperature from those listed:

Position	Input	Approx. Surface Temp.
OFF		
LOW	215 watts	392°F (200°C)
LOW MEDIUM	350 watts	536°F (280°C)
MEDIUM	550 watts	707°F (375°C)
HIGH	910 watts	932°F (500°C)

These commonly used temperatures allow users to heat many industrial materials (glue, solder, protective waxes, etc.) without constant supervision—Ideal for production line and factory heavy duty heating jobs.

## EMBEDDED HEATING ELEMENTS

High grade nickel chromium embedded in special refractory plate—Distributes heat energy evenly over whole surface—Refractory protects element from corrosion, prevents creep or sag, makes replacement (if ever necessary) simple and sure.

## RUGGED STAINLESS STEEL CASE

Built in two sections—Heavy gauge stainless steel separated by thick layer of high grade insulation—Supports heavy loads, keeps lower section cool, easy to keep clean.

MODEL NUMBER	ELECTRICAL RATINGS			TOP PLATE (Inches)		OVERALL SIZE (Inches)			WEIGHT (Pounds)		MAXIMUM OPERATING TEMPERATURE	PRICE
	VOLTS 50/60 CYCLES	AMPS MAX.	WATTS MAX.	W	D	W	H	D	NET	Ship		
HP-2305B	120	2.7	325	3⅝" Dia.		3⅝	3¼	4½	1½	2	700°F (371°C)	\$15.00
HP-2620R	240	4.16	1000	9	9	9	6¼	10	14¼	19	932°F (500°)	45.00
HP-2625R	120	8.32	1000	9	9	9	6¼	10	14¼	19	932°F (500°)	45.00



LABORATORY APPARATUS

SCIENTIFICALLY ENGINEERED  
CAREFULLY MANUFACTURED  
PROPERLY PRICED

THERMOLYNE CORPORATION

DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.



# ELECTRIC HOT PLATES TYPES 8800 and 9200

For those special laboratory jobs requiring hot plate temperatures to 1000°F, even heat distribution, precise temperature control, and glass hard blue porcelain-steel tops look at these outstanding THERMOLYNE features.

## PRECISE TEMPERATURE CONTROL

Thermolyne's specially designed demand type thermostatic control holds within  $\pm 5^\circ\text{F}$  over range from 200°F to 1000°F—Load determines power flow to maintain set temperature—Automatic compensation for fluctuation in voltage and ambient temperature.

## FAST HEAT-UP

Type 8800 reaches 500°F in 3 minutes; Only 5 Minutes for larger Type 9200 to reach 500°F.

## COOL OPERATING CASE— NO SCORCHED BENCH TOPS

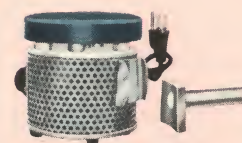
Stainless steel case—Perforated to keep control section cool for long life—Rugged to support heavy loads—Durable—Stays clean with minimum care.

## BLUE PORCELAIN-STEEL FLAT TOP

Defies spillage—resists stains, cleans easily, won't crack or spall under extremes of temperature differences.

## IDEAL FOR LAB SET-UPS

Standard dovetail socket adapts hot plate to various apparatus set-ups. Adaptor rod supplied with Type 8800 keeps hot plate from turning when suspended.



Pilot light glows when heat is on.



MODEL NUMBER	ELECTRICAL RATINGS			TOP PLATE (Inches)	OVERALL SIZE (Inches)			WEIGHT (Pounds)		MAXIMUM OPERATING TEMPERATURE	PRICE
	VOLTS 50/60 CYCLES	AMPS	WATTS		W	H	D	NET	Ship		
HP-A8805B	120	3.3	400	3¾ Dia.	3¾	3¾	4½	1½	2	1000°F (538°C)	\$17.00
HP-9215B	120	6.3	750	5½ Dia.	5½	4¾	6½	2¾	4	1000°F (538°C)	\$31.50



LABORATORY APPARATUS

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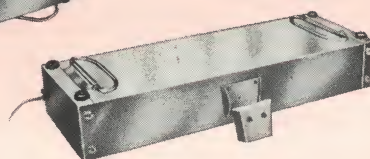
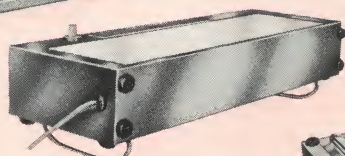
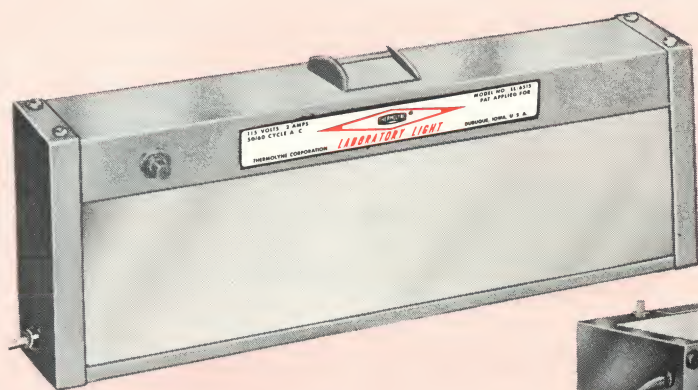
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DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.



# THERMOLYNE LABORATORY LIGHT



If a soft, white light will help, use a THERMOLYNE LABORATORY LIGHT.

A portable source of diffused light of moderate intensity — Deluxe cool white light color is most useful in laboratories — Surface temperature rise designed to give surface working temperature of 37 to 42°C; ideal for blood work, many other laboratory tests.

Various mountings, or may be used unmounted — Gives greatest flexibility of uses, handy for quick adaptation anywhere.

Sturdy stainless steel case, plastic lens for durability, takes knocks and keeps on working — Easy to clean, looks good, lamp easy to replace.

## TYPICAL USES:

Blood typing  
Phage typing  
Cross matching  
Colony counting  
Slide warmer  
Balance light  
Dissecting lamp  
View box  
Febrile agglutination studies  
Portable light source  
Negative retouching  
Tracing  
Shadow free desk lamp

## SPECIFICATIONS:

**DIMENSIONS:** 5" high, 12 $\frac{3}{8}$ " long, 2 $\frac{3}{8}$ " deep.

**WEIGHT:** Net 2 $\frac{1}{4}$  lbs. Shipping 3 $\frac{1}{2}$  lbs.

**ELECTRICAL DATA:** 120 volts, 60 cycles AC, .2 amps. Lamp, 8 watts 120 volts fluorescent.

Model LL-6515

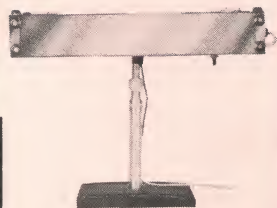
Price \$24.00

(without stand)

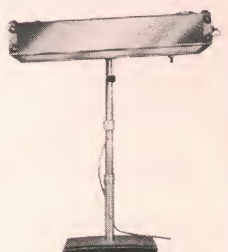
Replacement lamp

LMX7

\$3.15



7 $\frac{3}{4}$ " min. extension



20" max. extension

## APPARATUS STAND

Base and telescoping stand for THERMOLYNE Laboratory Light and other apparatus. Puts the light where it is most usable—Practically any position is easy to get (see series of smaller pictures)—Heavy cast iron base, aluminum riser tubes, collet type adjusting clamps, double swivel mount, standard dovetail fixture — Tightens firmly in chosen position, quick and easy to loosen for adjustments.

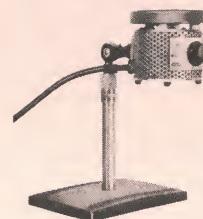
## SPECIFICATIONS:

**HEIGHT:** Min. 7 $\frac{3}{4}$ ", Max 20"

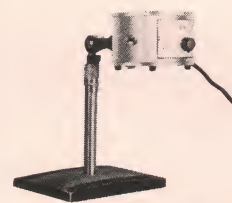
**WEIGHT:** Net, 6 lbs.; Shipping, 7 $\frac{1}{2}$  lbs.

**PRICE:** stand only, AY65X1A \$16.00

All prices are FAIR TRADE MINIMUM prices, F.O.B. shipping point, subject to change without notice.



Stand with HP-8800  
Hot Plate



Stand with S-7805  
Stir-Mate



LABORATORY APPARATUS

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PROPERLY PRICED

THERMOLYNE CORPORATION

DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.



# THERMOLYNE CONSTANT TEMPERATURE INCUBATING APPARATUS

Thermolyne Dri-Baths and incubators are constant temperature heating blocks or chambers, and are widely used in clinical, pathological, biochemical, biological and bacteriological laboratories. They are intended for incubation of small specimens at a constant, specified temperature.

Factory set at fixed standard temperatures of 37, 39, 56 or 100°C, they are ideally suited for prothrombin determinations, blood banking, cross matching, incubation of serums and cultures, blood chemistries, phosphatase analysis, amylase determinations, Coombs test, Rh antibody studies, or other similar tests and uses where closely held

constant temperatures within range of the above values are required.

Thermolyne Dri-Baths and incubators can be calibrated for other specific temperatures within their limits and can also be re-calibrated in the field if ever necessary. However, it is not recommended that a user attempt to continually reset his Dri-Bath for different temperatures. Any calibrating that is accurate requires considerable time to do properly at these low temperatures, and the modest cost of Thermolyne Dri-Baths makes it more economical to purchase additional units with fixed settings at the various desired temperatures than to use a technologist's valuable time for calibrating.

## TYPICAL USES:

Prothrombin times  
Blood typing  
Cross matching  
Coombs tests  
Coagulation studies  
Complement fixation studies  
Inactivation of serum  
Strain separations  
Lipase tests  
Amylase tests  
Phage typing  
Drying PBI specimens

Blood glucose  
Blood urea nitrogen  
Normalizing PBI specimens  
Phosphatase levels  
Antistreptolysin titers  
"Dry hole" cultures  
Water pollution tests  
Milk purity tests  
Warming local anaesthetics  
Bacteria cultures  
Evaporation to dryness

Some of the features that have made Thermolyne Dri-Baths so welcome in a great variety of laboratory situations are:

### CLEAN

Glassware and cuvettes stay clean and dry — no water films, scum or deposits to interfere with instrument readings or observations — No wiping of glassware to prevent dripping over tables, floors or work space — Hard, dry surfaces easy to clean, spills wipe off easily — Individual specimen wells minimize any chance of cross contamination.

### FACTORY SET FIXED CALIBRATION

Thermolyne Dri-Baths are factory set at a specified temperature. Standard settings for various units are listed, but other fixed calibrations can be obtained at slight extra cost — Units are calibrated at temperatures for the working area, i.e. by thermometer in liquid in test tube within the well. This means the temperature is *right* where you want it — Easily re-calibrated in the field if ever necessary.

### PRECISE TEMPERATURE CONTROL

Our own Double Delta control scientifically designed especially for this type of apparatus — Quick control re-

action to change holds temperatures well within rated  $\pm \frac{1}{2}^{\circ}\text{C}$  and uniform throughout all areas — Simple and rugged, it remains stable without attention for long periods of use. No drifting from set temperature.

### SIMPLE TO OPERATE —

#### ECONOMICAL — PORTABLE

Just plug into any convenient outlet. Stabilizes in minutes to rated temperature — So economical to operate can be left on continuously if desired — Compact, light in weight, can be stored readily, or takes very little bench top space — Modest cost and size allows each researcher or technologist to have an individual unit — Readily moved about the lab or to bedside if necessary.

### SCIENTIFICALLY DESIGNED

Engineered from scratch to do this specific job — No compromise — No short cuts in workmanship or materials — Models with viewing windows allow observation of test in progress — Cradle type rack permits gentle rocking or agitation — Test tubes spin freely in wells.



LABORATORY APPARATUS

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CAREFULLY MANUFACTURED  
PROPERLY PRICED

THERMOLYNE CORPORATION

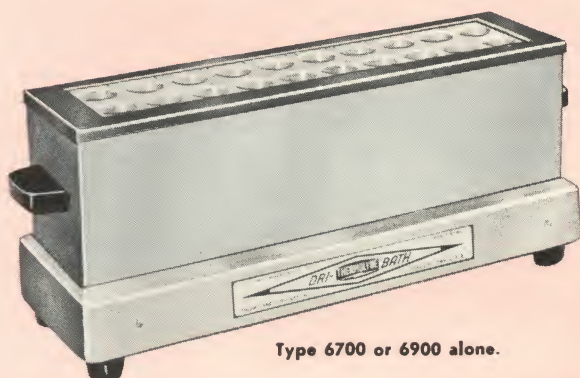
DUBUQUE, IOWA, U.S.A.

Printed in U.S.A.

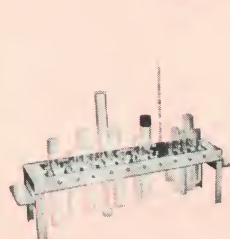


## THERMOLYNE DRI-BATH TYPE 5900

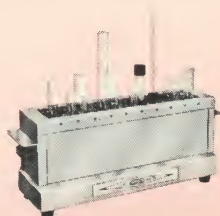
Ideal for prothrombin times, blood cross matching, blood typing, Coombs tests, coagulation studies, complement fixation studies, lipase tests, inactivation of serum, strain separations, amylase tests, and dozens of serology procedures. Suited for "dry hole" cultures, bacteria cultures, urine and blood cultures, warming of injectables just prior to administration, etc. Many advantages for the doctor, dentist, pathologist, or medical technologist.



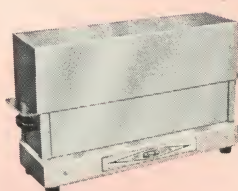
Type 6700 or 6900 alone.



Tube rack with assorted tubes



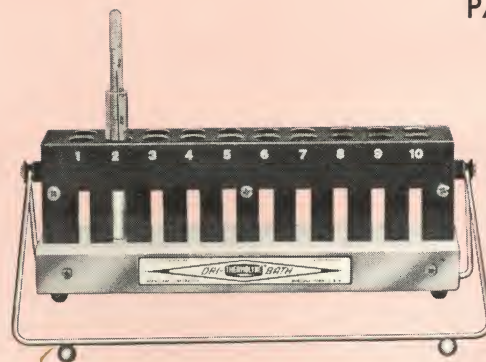
Macro DRI-Bath with rack in place



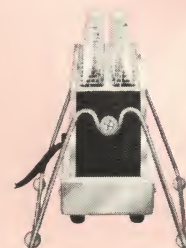
Macro DRI-Bath with light shield

## THERMOLYNE MICRO DRI-BATH TYPE 7900

Excellent for microchemical and microbiological procedures — Very good for geriatric and pediatric work where blood samples are small — Ideal for phosphatase assays — Takes test tubes up to 7 mm dia.



Model DB-5915 removed from cradle

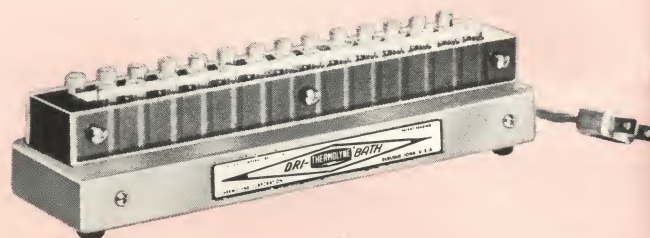


Model DB-5925E in cradle

## THERMOLYNE MACRO DRI-BATHS TYPE 6700 and 6900

Larger units, identical in size and appearance, differ only in temperature range — For incubation of test tubes up to 20 mm dia. — Usable for almost all laboratory incubating routines — Ideal for evaporating to dryness — Stainless steel rack holds mixed sizes of test tubes firmly in the position loaded — Accessory stainless steel light shield for culture of light sensitive bacteria, holds water for use as handy chill bath — Type 6700 low temperature, 6900 high temperature calibrations.

(Available for 25 mm tubes at extra cost)



MODEL NUMBER	NO. OF WELLS	WELL DIA.	WELL DEPTH	OVERALL SIZE			STANDARD CALIBRATIONS °C	VOLTS	MAX WATTS	WEIGHT		PRICE
				H	W	L				NET	SHIP	
DB-5915E	10	17/32	2	3 1/8	2 1/8	9	37, 56	120	120	2	3	\$39.50
DB-5925E	20	17/32	2	3 1/8	2 1/8	9	37, 56	120	120	2 1/2	3 1/2	49.50
*DB-5925E-23	40	15/64	1 1/2	2 7/8	2 1/8	9	37, 56	120	120	3	4	54.50
DB-A6725E	20	13/16	3 1/2	6 1/8	4 3/4	14 1/2	37, 39, 56	120	225	11	12 1/2	82.50
‡DB-A6735E	30	5/8	3 1/2	6 1/8	4 3/4	14 1/2	39	120	225	12	14 1/2	95.00
DB-A6925E	20	13/16	3 1/2	6 1/8	4 3/4	14 1/2	100	120	225	11	12 1/2	82.50
DB-A6925E-12	20	13/16	3 1/2	6 1/8	4 3/4	14 1/2	106	120	225	11	12 1/2	92.50
DB-7925E	28	5/16	3/4	2	2 1/8	9	37, 56	120	120	2	3	45.00

\*For Microcentrifuge Tubes

‡For Spectrophotometer Stabilization

All prices on this page are FAIR TRADE MINIMUM prices. F.O.B. Shipping point, subject to change without notice.



## THERMOLYNE CULTURE INCUBATOR TYPE 6800

The last word in convenience for bench top incubation of all well known culture media and containers — Will hold 18 standard 100 mm glass petri dishes, 48 100 mm plastic disposable dishes — Contents easily accessible — Three stainless steel shelves invert to hold round bottles or tubes, easily removed to incubate tall bottles — Body conducts heat evenly to all surfaces, radiates uniformly to entire load — Natural flow of air inside chamber unrestricted — Light trap protects light sensitive bacteria — Thermometer port may be used to verify temperature for critical work.

### SPECIFICATIONS:

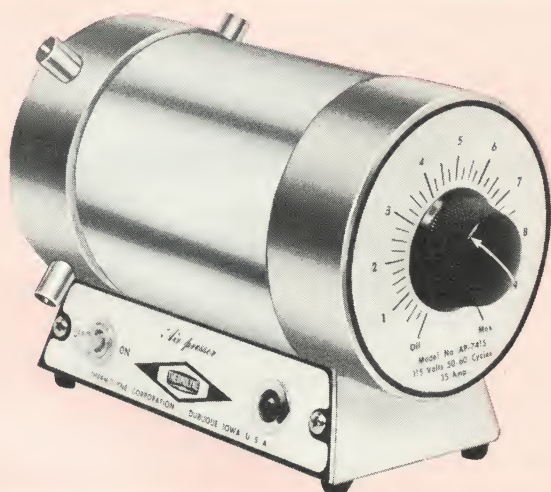
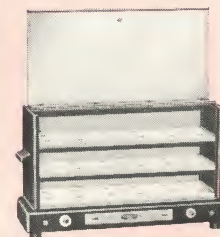
37°C standard temperature

8½" high, 14" wide, 4½" deep

120 volts 50/60 cycle AC 225 watts

WEIGHTS: Net, 10 lbs.; Shipping, 13 lbs.

MODEL I-A6825E.....\$75.00



## THERMOLYNE AIR-PRESSOR

A portable source of low pressure air for laboratory use— Excellent for use in conjunction with THERMOLYNE Macro Dri-Bath for rapid evaporation to dryness — Will handle four Dri-Baths equipped with Dri-Rack accessories, or 80 specimens per load — Centrifugal blower supplies flow of air to four outlets, motor speed adjustable to regulate volume.

### SPECIFICATIONS:

4" wide, 5" high, 8" long

120 volts 50/60 cycles AC, .35 amps.

WEIGHTS: Net 4½ lbs.; shipping, 6 lbs.  
Includes 4 pieces ⅜" ID tubing 30" long.

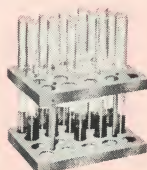
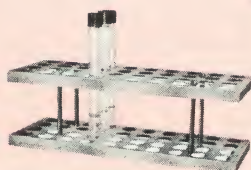
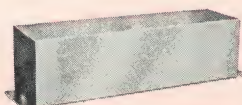
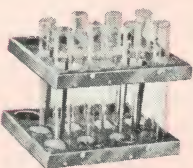
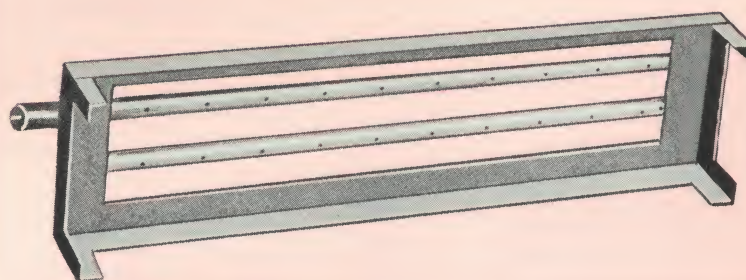
MODEL AP-7415 .....\$75.00

## THERMOLYNE TUBE RACK

For use with THERMOLYNE Macro Dri-Bath. Keeps tubes of various sizes firmly in position loaded. Stainless steel. One included in price of Dri-Bath models DB-A6725E DB-A6925E. Extra racks part no. BC67X4A.....\$11.75

## THERMOLYNE DRI-RACK

Used with THERMOLYNE Macro Dri-Bath for evaporation to dryness. When connected to a low pressure air source or THERMOLYNE Air-Pressor directs a jet of air into the center of test tube in Dri-Bath well. Air jet scavenges vapor preventing re-condensation in the tube, breaks up bubbles which cause boil-over. One included in price of DB-A6925E-12, Extra racks part no. AY69X1A.....\$11.00



## TEST TUBE RACKS

For use with THERMOLYNE Culture Incubator or PBI Furnaces type 6000 and 6100. Stainless steel, holes marked for specimen identification.

AY61X2A 12 tubes 25mm dia .....\$ 8.50

AY61X4A 20 tubes 15mm dia ..... 8.50

AY82X2A 40 tubes 15mm dia ..... 17.00

Long handle for loading test tube racks into furnaces.

AY60X1.....\$3.50

Stainless steel light shield, chill bath for DB-6700, 6900 series Dri-Baths.

AY67X1A.....\$6.50



# THERMOLYNE MAGNETIC STIRRERS

There are four THERMOLYNE magnetic stirrers, a type or combination for most laboratory requirements — The well known THERMOLYNE Stir-Plate, a combination stirrer and hot plate; the Stir-Light, a stirrer with illuminated surface; the THERMOLYNE Stirrer, a general purpose magnetic stirrer; and the Stir-Mate, a compact magnetic stirrer for use in tight places. Each is designed for a specific class of work, but all are ideally suited for general laboratory stirring. All have these outstanding features:

## 1. STRONG MAGNETIC COUPLING

The driving magnet is set close to the surface, stays "locked in" with stirring bar — No jitterbugging.

## 2. PRECISE, TROUBLE-FREE CONTROL

Stepless speed control allows the operator to use the best stirring speed for each specific job, from barely moving to violent churning. Especially stable at slow stirring speeds.

## THERMOLYNE STIR-PLATE

### TYPICAL USES

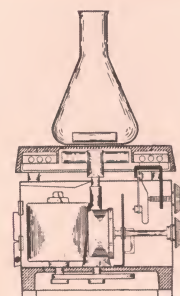
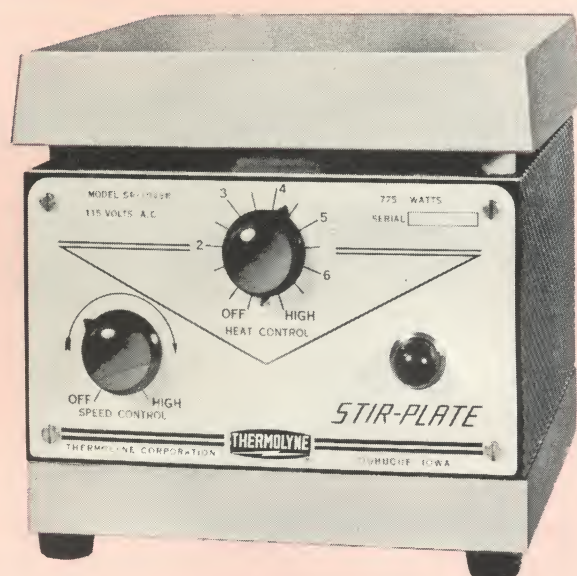
Preparation of agar media  
Making up reagent solutions  
Preparation of dyes for color analysis  
Acid-base titrations requiring specific temperature  
Endocrinology studies  
Hydrogenation of fats and vegetable oils

Biochemical research  
Cell suspensions for tissue cultures  
Stirring oil baths  
Distillation studies  
Recrystallization studies  
Electro-plating  
Washing resins

A THERMOLYNE magnetic stirrer combined with a top quality hot plate — Will heat, stir, or combine operations — Each system has its own controls and functions independently — Really two good units in one for maximum utility.

Hot plate will reach 700°F quickly — Temperature setting is infinitely stepless — Extra sensitive thermostatic control of exclusive THERMOLYNE design holds surface temperature within  $\pm 5^\circ\text{F}$  of set point from 10°F over ambient to max — Cast aluminum top plate, machined flat, conducts heat evenly over entire surface—Embedded heating element for even heat, maximum element protection — Ventilated construction keeps controls and motor cool — Perforated stainless steel case resists corrosion.

Stirrer section has large Alnico V magnet on large, widely separated bearings — Offset motor, belt drive keep motor in coolest part of case — Motor temperature rise is very small, no heat unless it is wanted.



	MODEL NUMBER	ELECTRICAL DATA				DIMENSIONS			WEIGHT		PRICE*
		VOLTS	WATTS	AMPS	CYCLES	H	W	D	NET	SHIP	
Stir-Plate	SP-A1025B	120	840		50/60	6 $\frac{7}{8}$	7 $\frac{1}{8}$	7 $\frac{1}{8}$	9	10 $\frac{1}{2}$	\$84.50
Stir-Light	SL-7225	120		.55	60	4 $\frac{1}{2}$	7	7	5 $\frac{1}{4}$	6 $\frac{1}{2}$	54.50
Stirrer	S-7225	120		.35	50/60	4 $\frac{1}{2}$	7	7	4 $\frac{1}{4}$	5 $\frac{1}{2}$	34.50
Stir-Mate	S-7805	120		.15	50/60	3	4 $\frac{1}{4}$ dia		1 $\frac{1}{2}$	2 $\frac{1}{2}$	32.50

\* All THERMOLYNE magnetic stirrers shipped with 2 Teflon covered stirring bars; 1 each 5/16" dia. x 1" long, 3/8" dia. x 2" long.



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Printed in U.S.A.



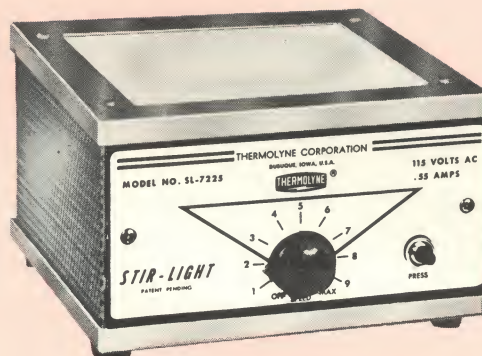
## THERMOLYNE STIR-LIGHT

### TYPICAL USES

Routine titrations  
Clinical chloride and calcium titrations  
EDTA titrations  
Monomer titrations  
Algae culturing  
Preparation of drug solutions  
Extractions  
To keep media in motion to prevent settling when dispensing  
Magnesium titrations on muscle tissue

A THERMOLYNE magnetic stirrer with illuminated top — Light shining through vessel makes observation of contents easy — Titration end point color change clearly seen — When used with titration swivel base makes back-titration for accuracy fast, precise; set-up moves quickly from one burette to the other without adjustment — Same strong magnetic coupling and control features found in all THERMOLYNE magnetic stirrers — Perforated stainless steel case for cool operation — Easy to clean, rugged, supports sizable loads.

(A glass sheet is recommended for use with solvents — protects top, insulates heat sensitive titrations.)

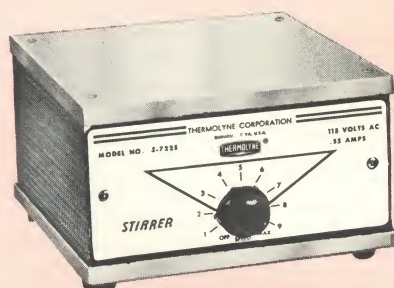


## THERMOLYNE STIRRER

### TYPICAL USES

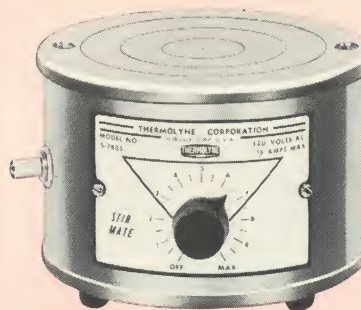
Solvent agitation  
Mixing solutions  
Sewage analysis  
Stirring organic reactions  
Mixing photographic solutions  
Making standard reagents  
Titrations  
Stirring buffers and resins  
Use with gradient elution systems  
Research requiring constant stirring speeds  
Bacteria cultures  
Algae cultures  
Stirring large volumes of aqueous solutions

Same as above without light — Excellent for general laboratory stirring — Aluminum top stays flat, easy to clean.



## THERMOLYNE STIR-MATE

A compact magnetic stirrer for use where others are too large — Same strong magnetic coupling and control features in compact case — Fits into lattice supports, will hang on side of vessel and stir — Handles Conway dishes easily — Stainless steel case, aluminum top with concentric rings for easy centering of vessel — Runs cool, long life, no problems — Light weight, small size for convenience. On-off switch allows starting and stopping without losing speed adjustment.



### TITRATION SWIVEL BASE

Saves work, saves time, aids accuracy — Fits over column of 1/2" dia. burette stand — Swings back and forth easily — Apparatus set up under one burette automatically positioned for the other, apparatus moved while operating — Makes back-titration fast, easy.

ORDER PT72X6.....\$6.00





# THERMOLYNE "PBI" FURNACE TYPE 6100

**ONE UNIT COMBINES DRYING AND ASHING FUNCTIONS,**  
Minimum handling of specimens

## TWO FACTORY SET TEMPERATURES:

(May be adjusted for other commonly used temperatures easily and quickly.)

100°C low temperature zone for drying PBI tubes without danger of boil-over—Works for drying other precipitates, etc., where high temperatures are not needed.

600°C high temperature zone for ashing PBI tubes or other material where this temperature is needed.

## ELEMENTS IN ALL SIX SIDES FOR UNIFORM HEAT

Low temperature gradient, all parts of load reach same temperature—

## SIMPLE, RELIABLE INPUT CONTROL, EASY TO USE

All controls on front panel—Large dials, easy to read figures—Simple adjustments make control easy—Temperature controlled by percentage input timer, automatically compensates for voltage fluctuations and ambient temperature change to hold chamber temperatures even. *Safe, too!* Grounded three wire cord and three prong plug. Over-ride timer provides fast heat-up to working temperature.

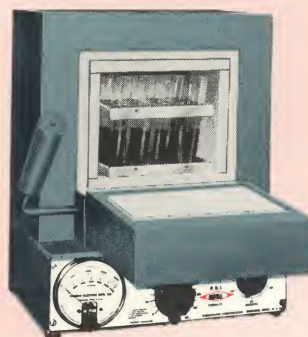
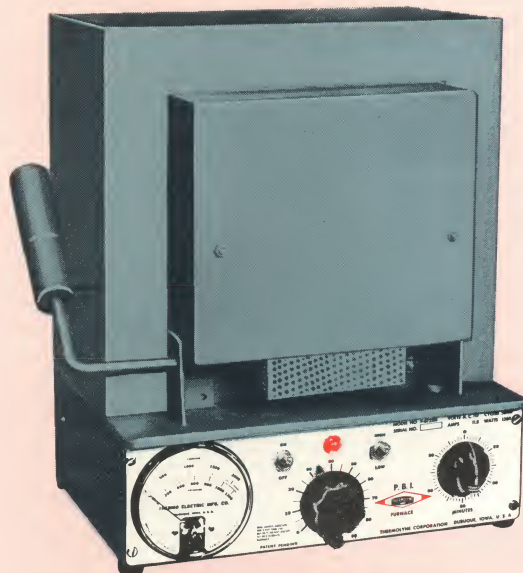
## PYROMETER FOR EASY TEMPERATURE CHECKS

Accurate, full view, double scale (°F & °C) constantly indicates chamber temperature. Meter coil is thermistor compensated for ambient temperature variations, gives true readings.

## ECONOMICAL SIZE

Largest input that can be plugged into regular outlets—20 tubes per load cuts costs, makes regular processing convenient, cuts delays.

All prices on this page are  
FAIR TRADE MINIMUM prices,  
F.O.B. Shipping point, subject  
to change without notice.



AY61X2A



AY61X1A

Scientifically designed specifically for this test  
**TYPICAL USES:**

- Drying PBI specimens
- Ashing PBI specimens
- Ashing bone or other biological material
- Activating chromatographic supports
- Drying organic or inorganic precipitates

## ACCESSORIES:

- AY61X1A (Handling tongs) **\$1.50**
- AY61X2A (Rack, 12 tubes, 25 x 100 mm) **\$8.50**
- AY61X4A (Rack, 20 tubes 15 x 125 mm) **\$8.50**

Furnace is shipped with 1 tong and 1 rack, specify rack desired.

FURNACE MODEL NUMBER	ELECTRICAL RATINGS					CHAMER SIZE (Inches)			OVERALL SIZE (Inches)			WEIGHT (Pounds)		PRICE
	LOW			HIGH										
	VOLTS	AMPS.	WATTS	AMPS.	WATTS	W	H	D	W	H	D	NET	SHIP.	
F-6125M	120	1	120	12.9	1550	6½	5½	4½	12¾	42	53	42	53	\$175.00



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# PORTABLE PYROMETER - MILLIVOLTMETER

**For general use in Laboratory,  
Shop, School, or Field**

## TYPICAL USES:

Measuring temperatures of:

Heaters	Sand baths	Gasses
Hot plates	Stacks	Flames
Furnaces	Liquids	Flues
Ovens	Pipes	Machine cases
Appliances	Bearings	

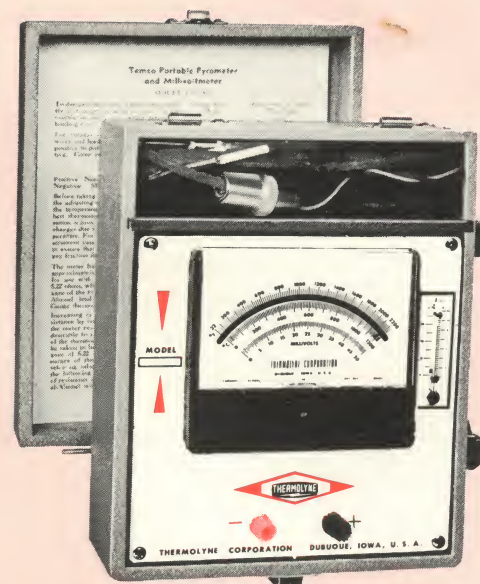
Checking Temperature gages

Measuring electronic circuit output

Engineering Labs

Service shops

Schools



## MAXIMUM UTILITY

Completely self-contained—Weighs only 3 lbs.—Easily carried for spot checks—Convenient for temperature reading of hard to reach spots—Combined 8' length of thermocouple and lead wire keeps instrument safe distance from extremes of heat, vibration, magnetic fields, or other injurious or interfering influences.

## COMPACT — PORTABLE

Attractive case, designed to protect meter from handling hazards, easy to carry, quick to use—Cover easily removed, replaced—Special compartment for thermocouple—Large 4-way binding posts, clearly marked for polarity—Cover contains all meter data—Fluid thermometer for setting cold junction temperatures permanently mounted beside meter.

## HIGH QUALITY FEATURES

D'Arsonval type meter—Alnico V magnet—Good damping action—Low mass integral magnesium pointer with 3 helical coil balance weights—No zero shift—Polished pivots—Jewel bearings in cushion mounts—Thermistor circuit continuously compensates for internal resistance changes due to ambient temperature changes.

## SENSITIVE — ACCURATE

Sensitivity, 2.5 ohms per millivolt.

Accuracy, error less than 1% of full scale deflection.

## FOUR TRIPLE SCALE RANGES

Scales illustrated at right  $\frac{3}{4}$  actual size—Fine lines and large numbers are easy to read—Mirror eliminates parallax reading errors—Direct reading of Fahrenheit or Centigrade temperatures, millivolts.

## SPECIFICATIONS:

Case size: 7" wide, 4½" high, 9" long

Weight: Net, 3 lbs.; Shipping 6¼ lbs.

Model PM-1M18 is supplied with a Chromel/Constantan thermocouple.

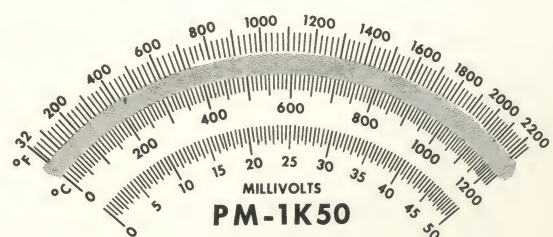
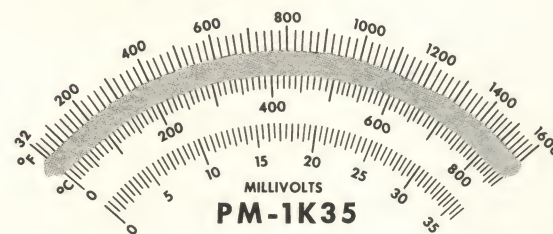
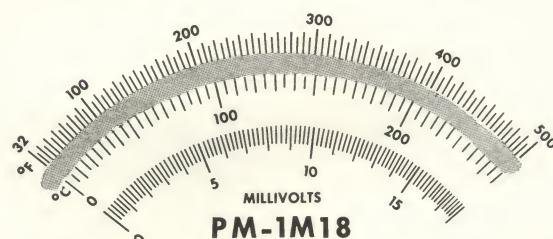
All other Models Chromel/Alumel.

Order by model number under scale desired.

**PRICE (all models)**

**\$55.00**

All Prices Are FAIR TRADE MINIMUM Prices, F.O.B. Shipping Point; Subject To Change Without Notice.



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# MASTERCRAFT Laboratory Meters

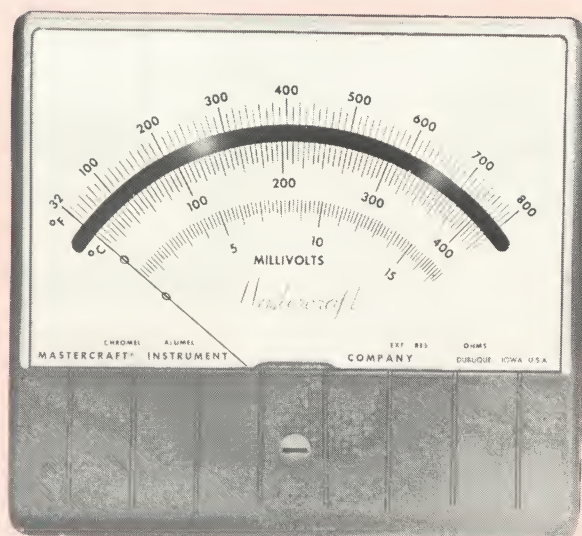
A complete line of laboratory electrical meters for bench use or mounting in apparatus of the user's construction. Six sizes, many ranges to suit most needs . . . illustrations 1/2 size.

## TYPICAL USES:

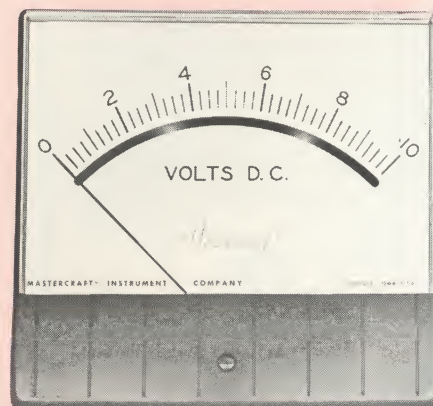
Engineering Laboratories  
Electronics Laboratories  
Service Shops  
Quality Control

### Schools:

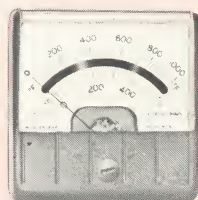
Physics Laboratories  
General Science Laboratories  
Trade School



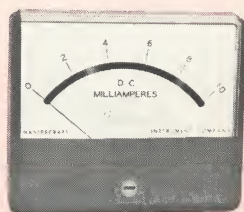
MODEL 600L-6"



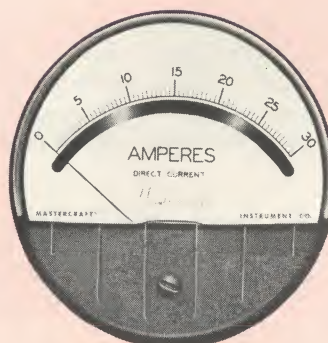
MODEL 450L-4 1/2"



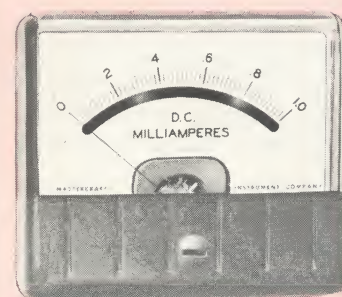
MODEL 200L - 2 1/8"



MODEL 250L-2 1/2"



MODEL 351L-3 1/2"



MODEL 350L-3 1/2"

## FEATURES:

- D'Arsonval moving coil movements
- Polished jewel bearings
- Cushioned bearing mounts
- Heat treated and polished steel pivots
- Massive one piece die cast aluminum frame
- Alnico permanent magnets
- Phosphor bronze short length high torque hair springs normalized to prevent zero shift
- One piece hair line magnesium pointer with three helical coil balance weights

Standard accuracy is 1% of full scale deflection for DC meters, 3% for AC meters. Greater accuracy can be guaranteed at extra cost. AC meters use rectifier movements for greater sensitivity, and are calibrated to RMS values. Design frequency is 60 cycles per second. Internal resist-

- Sintered iron pole pieces
- Mechanically isolated terminals
- Steel parts treated to resist corrosion
- All parts anti-static treated
- Solid state network compensates for temperature coefficient of copper error of moving coil.
- Wrap-around plastic front cover for maximum light for better visibility of pointer and scale
- Mirrored scales eliminate parallax errors
- Automatic bi-metal cold junction compensation built in.

ance for each meter furnished if requested at time of order. Voltmeters have internal resistance of 2000 ohms per volt. Prices for each model are listed in the tables on the opposite page, and include the meter only. Meters are available mounted in several case styles. Write for details.



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# MASTERCRAFT®

## PANEL METERS

### AMMETERS

	MODEL 200L — 2 1/8"		MODEL 250L—2 1/2"		MODEL 350L—3 1/2"		MODEL 351L—3 1/2"		MODEL 450L—4 1/2"		MODEL 600L—6"	
MICROAMPERES	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC
0-20	\$24.50		\$24.80		\$25.50		\$25.50		\$26.60		\$29.20	
0-30	22.60		22.90		23.60		23.60		24.70		27.30	
0-50	20.80	27.40	21.10	27.70	21.80	28.40	21.80	28.40	22.90	29.50	25.50	32.10
0-100	18.90	25.90	19.20	26.20	19.90	26.90	19.90	26.90	21.00	28.00	23.60	30.60
0-200	16.60	22.80	16.90	23.10	17.60	23.80	17.60	23.80	18.70	24.90	21.30	27.50
0-300	16.40	20.50	16.70	20.80	17.40	21.50	17.40	21.50	18.50	22.60	21.10	25.20
0-500	16.20	20.10	16.50	20.40	17.20	21.10	17.20	21.10	18.30	22.20	20.90	24.80
MILLIAMPERES	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC
0-1	\$15.80	\$19.60	\$16.10	\$19.90	\$16.80	\$20.60	\$16.80	\$20.60	\$17.90	\$21.70	\$20.50	\$24.30
0-1.5	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-2	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-3	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-5	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-10	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-15	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-20	15.80	19.60	16.10	19.90	16.80	20.60	16.80	20.60	17.90	21.70	20.50	24.30
0-25	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
0-30	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
0-50	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
0-100	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
0-200	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
0-300	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
0-500	17.30	22.80	17.60	23.10	18.30	23.80	18.30	23.80	19.40	24.90	22.00	27.50
AMPERES	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC
0-1	\$16.90	\$21.90	\$17.20	\$22.20	\$17.90	\$22.90	\$17.90	\$22.90	\$19.00	\$24.00	\$21.60	\$26.60
0-2	16.90	21.90	17.20	22.20	17.90	22.90	17.90	22.90	19.00	24.00	21.60	26.60
0-3	16.90	21.90	17.20	22.20	17.90	22.90	17.90	22.90	19.00	24.00	21.60	26.60
0-5	16.90	21.90	17.20	22.20	17.90	22.90	17.90	22.90	19.00	24.00	21.60	26.60
0-10	16.90	21.90	17.20	22.20	17.90	22.90	17.90	22.90	19.00	24.00	21.60	26.60
0-15	16.90	21.90	17.20	22.20	17.90	22.90	17.90	22.90	19.00	24.00	21.60	26.60
0-25	16.90	21.90	17.20	22.20	17.90	22.90	17.90	22.90	19.00	24.00	21.60	26.60
0-30	17.80	22.80	18.10	23.10	18.80	23.80	18.80	23.80	19.00	24.00	22.50	27.50
0-50	18.30	23.20	18.60	23.50	19.30	24.20	19.30	24.20	20.40	25.30	23.00	27.90

Self-contained  
Shunts.

### VOLTMETERS

MILLIVOLTS	DC only		DC only		DC only		DC only		DC only		DC only	
0-15	\$23.30		\$23.60		\$24.30		\$24.30		\$25.40		\$28.00	
0-25	19.50		19.80		20.50		20.50		21.60		24.20	
0-50	15.80		16.10		16.80		16.80		17.90		20.50	
0-100	15.80		16.10		16.80		16.80		17.90		20.50	
VOLTS	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	AC
0-1	\$17.30	\$22.20	\$17.60	\$22.50	\$18.30	\$23.20	\$18.30	\$23.20	\$19.40	\$24.30	\$22.00	\$26.90
0-3	17.30	22.20	17.60	22.50	18.30	23.20	18.30	23.20	19.40	24.30	22.00	26.90
0-5	17.30	22.20	17.60	22.50	18.30	23.20	18.30	23.20	19.40	24.30	22.00	26.90
0-10	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-15	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-25	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-30	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-50	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-100	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-150	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-300	17.30	21.40	17.60	21.70	18.30	22.40	18.30	22.40	19.40	23.50	22.00	26.10
0-500	18.70	21.40	18.00	21.70	18.70	22.40	18.70	22.40	19.80	23.50	22.40	26.10

2000 Ohms/Volts

### PYROMETERS

Range		Approximate resistance, ohms		THERMOCOUPLE (Not Included)	PRICE		PRICE		PRICE		PRICE		PRICE	
°F	°C	Internal	External		Model 200L	Model 250L	Model 350L	Model 351L	Model 450L	Model 600L	Model 200L	Model 250L	Model 350L	Model 600L
0-3000	0-1650	70	10	Pt/Pt 13% Rho	\$22.90	\$23.20	\$23.90	\$23.90	\$25.00	\$27.60				
0-2500	0-1370	212	10	Chromel/Alumel	21.20	21.50	22.20	22.20	23.30	25.90				
0-2000	0-1100	172	10	Chromel/Alumel	21.20	21.50	22.20	22.20	23.30	25.90				
0-1500	0-800	179	10	Iron/Constantan	21.20	21.50	22.20	22.20	23.30	25.90				
0-1000	0-500	112	10	Iron/Constantan	21.50	21.80	22.50	22.50	23.60	26.20				
0-750	0-400	70	10	Iron/Constantan	22.40	22.70	23.40	23.40	24.50	27.10				
0-500	0-260	52	10	Iron/Constantan	23.00	23.30	24.00	24.00	25.10	27.70				
0-300	0-150	22	10	Iron/Constantan			26.30	26.30	27.40	30.00				
-75 to +225	-60 to +110	22	10	Iron/Constantan			27.70	27.70	28.80	31.40				
-200 to +100	-130 to + 40	22	10	Copper/Constantan			33.10	33.10	34.20	36.80				





THERMOLYNE CORPORATION  
2555 KERPER BOULEVARD  
DUBUQUE, IOWA 52001

DEAR SIR:

We sincerely appreciate your  
interest in our.....

[ July 19, 1966 ]

[ Lablite + Stand ]

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**THERMOLYNE** and **TEMCO** products are sold by leading scientific and industrial supply companies. Our dealers who serve your area are:

Macalaster Bicknell Co.  
P. O. Box 5, Westwood Branch  
Syracuse, New York

We are sure you will find them competent and anxious to help you select and apply **THERMOLYNE** and **TEMCO** products to solve your problems. We have asked them to contact you soon and give you any help they can. They carry **THERMOLYNE** and **TEMCO** products in stock, and will be able to supply your equipment promptly.

In the meantime we are sending the literature which contains the specific information you requested. We thank you for this opportunity to serve you, and if we may be of further service please feel free to call on us.

Very truly yours,

**THERMOLYNE CORPORATION**

R 568



## HISTORY

In the 1930's a Chicago dentist designed and built a small electric furnace for his own laboratory which performed so well that he decided to offer it to the dental profession. A small factory was set up which the dentist operated as a side line until it grew too big for his part time attention. It was at this time, 1942, that the present management of Thermolyne Corporation acquired the business and began operations as Thermo Electric Manufacturing Company.

In 1943 the company moved to Dubuque and immediately began to expand by developing other sizes and types of furnaces for general laboratory use. This expansion has been continuous until now the line includes 11 major types with many model variations.

Controls were also developed for the furnaces and proved so satisfactory that many are now sold to operate other manufacturers' apparatus. Two of them are especially unique and are protected by patents. The Amplitrol is a fully automatic electronic type, and the Thermolyne Stepless Input Control is a manually adjusted thermally operated unit. Many controls have been developed especially for our other items of electrical laboratory apparatus such as hot plates, constant temperature devices, incubators, etc. Much of the success of our new developments is due to the fact that they are engineered completely for their specific use.

Laboratory type hot plates were developed next, and in August 1949 the famous Type 1900 was introduced. It soon became America's favorite laboratory hot plate, a position it still holds. Now, eight different types of hot plates are produced, each of the same high quality and engineered for laboratory use.

A constant flow of new products has followed, including Stir-Plates (hot plate — magnetic stirrer) Stir-Light (magnetic stirrer with light, especially useful for titrations) Stir-Mate (micro size magnetic stirrer for difficult set-ups) Portable Pyrometer—Millivoltmeter, laboratory Light with stand for multiple use, Electrical indicating instruments, and many special items for the medical-biological field, such as PBI furnaces with speed-up drying systems, Culture Incubators, and several models of Dri-Bath Incubators. Every piece of equipment contains something new and original in its make-up. There are no copies of something already on the market.

Temco was the trade mark of the original company, but in 1960 the company name was changed to Thermolyne Corporation, and since that time all new products have been introduced under the trade mark "Thermolyne". However, there has been no change in ownership or management since 1942, and we expect to continue the same policy of research and development of new products for the scientific apparatus industry that has been so successful for us in the past.

## SERVICE AND REPAIR

Parts commonly needed for repairs (generally heating elements) are stocked by many of our dealers or can be obtained promptly from the factory. Element replacement on furnaces and hot plates is fairly simple and is generally done by the user. To save time and transportation expense we encourage the user to check first with his dealer when service or repairs are needed. Most dealers are equipped to handle many of these repairs or can otherwise give proper advice for handling. If apparatus is returned to the factory it should be carefully packed to prevent additional damage in shipment and complete information regarding the trouble and what is wanted should be sent at the same time. Thermolyne is prepared to repair any of its products, regardless of age, if practical to do so.

## GUARANTEE

Thermolyne has no written guarantee but probably settles complaints on a more liberal basis than many written ones would allow. Our company policy manual of instructions to employees reads, "we always want to be fair and anything questionable should be settled on the liberal side." Defects in material and workmanship will be corrected free of charge, at the factory unless it is more satisfactory to the user for us to send a free replacement part which he installs at his own expense. The life of heating elements is affected to such a degree by overheating or failure due to contamination that we ask for their return to the factory if a defect is claimed. Credit for replacement elements sent in the meantime will be issued if our inspection reveals that the failure was not due to excessively high temperatures or contamination.

## TERMS OF SALE

All Thermolyne prices are Fair Trade Minimum prices, F.O.B. Dubuque, Iowa, U.S.A. and subject to change without notice.



## TEMPERATURE CONVERSION TABLE

Read the reference temperature in bold face type in the center column. The corresponding Centigrade temperature is at the left in the gray shaded column. The corresponding Farenheit temperature is at the right in the pink shaded column.

**Temperature Conversion Formulae:**  $^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$

$$^{\circ}\text{F} = 9/5 \quad ^{\circ}\text{C} + 32$$

C	Ref.	F	C	Ref.	F	C	Ref.	F	C	Ref.	F	C	Ref.	F	C	Ref.	F	C	Ref.	F	C	Ref.	F
—17.8	0	32	24.4	76	168.8	321	610	1130	743	1370	2498	1166	2130	3866	1588	2890	5234	2010	3650	6602	2432	4410	7970
—17.2	1	33.8	25.0	77	170.6	327	620	1148	749	1380	2516	1171	2140	3884	1593	2900	5252	2016	3660	6620	2438	4420	7988
—16.7	2	35.6	25.6	78	172.4	332	630	1166	754	1390	2534	1177	2150	3902	1599	2910	5270	2021	3670	6638	2433	4430	8006
—16.1	3	37.4	26.1	79	174.2	338	640	1184	760	1400	2552	1182	2160	3920	1604	2920	5288	2027	3680	6656	2449	4440	8024
—15.6	4	39.2	26.7	80	176.0	343	650	1202	766	1410	2570	1188	2170	3938	1610	2930	5306	2032	3690	6674	2454	4450	8042
—15.0	5	41.0	27.2	81	177.8	349	660	1220	771	1420	2588	1193	2180	3956	1616	2940	5324	2038	3700	6692	2460	4460	8060
—14.4	6	42.8	27.8	82	179.6	354	670	1238	777	1430	2606	1199	2190	3974	1621	2950	5342	2043	3710	6710	2466	4470	8078
—13.9	7	44.6	28.3	83	181.4	360	680	1256	782	1440	2624	1204	2200	3992	1627	2960	5360	2049	3720	6728	2471	4480	8096
—13.3	8	46.4	28.9	84	183.2	366	690	1274	788	1450	2642	1210	2210	4010	1632	2970	5378	2054	3730	6746	2477	4490	8114
—12.8	9	48.2	29.4	85	185.0	371	700	1292	793	1460	2660	1216	2220	4028	1638	2980	5396	2060	3740	6764	2482	4500	8132
—12.2	10	50.0	30.0	86	186.8	377	710	1310	799	1470	2678	1221	2230	4046	1643	2990	5414	2066	3750	6782	2488	4510	8150
—11.7	11	51.8	30.6	87	188.6	382	720	1328	804	1480	2696	1227	2240	4064	1649	3000	5432	2071	3760	6800	2493	4520	8168
—11.1	12	53.6	31.1	88	190.4	388	730	1346	810	1490	2714	1232	2250	4082	1654	3010	5450	2077	3770	6818	2499	4530	8186
—10.6	13	55.4	31.7	89	192.2	393	740	1364	816	1500	2732	1238	2260	4100	1660	3020	5468	2082	3780	6836	2504	4540	8204
—10.0	14	57.2	32.2	90	194.0	399	750	1382	821	1510	2750	1243	2270	4118	1666	3030	5486	2088	3790	6854	2510	4550	8222
—9.44	15	59.0	32.8	91	195.8	404	760	1400	827	1520	2768	1249	2280	4136	1671	3040	5504	2093	3800	6872	2516	4560	8240
—8.89	16	60.8	33.3	92	197.6	410	770	1418	832	1530	2786	1254	2290	4154	1677	3050	5522	2099	3810	6890	2521	4570	8258
—8.33	17	62.6	33.9	93	199.4	416	780	1436	838	1540	2804	1260	2300	4172	1682	3060	5540	2104	3820	6908	2527	4580	8276
—7.78	18	64.4	34.4	94	201.2	421	790	1454	843	1550	2822	1266	2310	4190	1688	3070	5558	2110	3830	6926	2532	4590	8294
—7.22	19	66.2	35.0	95	203.0	427	800	1472	849	1560	2840	1271	2320	4208	1693	3080	5576	2116	3840	6944	2538	4600	8312
—5.67	20	68.0	35.6	96	204.8	432	810	1490	854	1570	2858	1277	2330	4226	1699	3090	5594	2121	3850	6962	2543	4610	8330
—6.11	21	69.8	36.1	97	206.6	438	820	1508	860	1580	2876	1282	2340	4244	1704	3100	5612	2127	3860	6980	2549	4620	8348
—5.56	22	71.6	36.7	98	208.4	443	830	1526	866	1590	2894	1288	2350	4262	1710	3110	5630	2132	3870	6998	2554	4630	8366
—5.00	23	73.4	37.2	99	210.2	449	840	1544	871	1600	2912	1293	2360	4280	1716	3120	5648	2138	3880	7016	2560	4640	8384
—4.44	24	75.2	37.8	100	212.0	454	850	1562	877	1610	2930	1299	2370	4298	1721	3130	5666	2143	3890	7034	2566	4650	8402
—3.89	25	77.0	43	110	230	460	860	1580	882	1620	2948	1304	2380	4316	1727	3140	5684	2149	3900	7052	2571	4660	8420
—3.33	26	78.8	49	120	248	466	870	1598	888	1630	2966	1310	2390	4334	1732	3150	5702	2154	3910	7070	2577	4670	8438
—2.78	27	80.6	54	130	266	471	880	1616	893	1640	2984	1316	2400	4352	1738	3160	5720	2160	3920	7088	2582	4680	8456
—2.22	28	82.4	60	140	284	477	890	1634	899	1650	3002	1321	2410	4370	1743	3170	5738	2166	3930	7106	2588	4690	8474
—1.67	29	84.2	66	150	302	482	900	1652	904	1660	3020	1327	2420	4388	1749	3180	5756	2171	3940	7124	2593	4700	8492
—1.11	30	86.0	71	160	320	488	910	1670	910	1670	3038	1332	2430	4406	1754	3190	5774	2177	3950	7142	2599	4710	8510
—0.56	31	87.8	77	170	338	493	920	1688	916	1680	3056	1338	2440	4424	1760	3200	5792	2182	3960	7160	2604	4720	8528
0	32	89.6	82	180	356	499	930	1706	921	1690	3074	1343	2450	4442	1766	3210	5810	2188	3970	7178	2610	4730	8546
0.56	33	91.4	88	190	374	504	940	1724	927	1700	3092	1349	2460	4460	1771	3220	5828	2193	3980	7196	2616	4740	8564
1.11	34	93.2	93	200	392	510	950	1742	932	1710	3110	1354	2470	4478	1777	3230	5846	2199	3990	7214	2621	4750	8582
1.67	35	95.0	99	210	410	516	960	1760	938	1720	3128	1360	2480	4496	1782	3240	5864	2204	4000	7232	2627	4760	8600
2.22	36	96.8	100	212	413	521	970	1778	943	1730	3146	1366	2490	4514	1788	3250	5882	2210	4010	7250	2632	4770	8618
2.78	37	98.6	104	220	428	527	980	1796	949	1740	3164	1371	2500	4532	1793	3260	5900	2216	4020	7268	2638	4780	8636
3.33	38	100.4	110	230	446	532	990	1814	954	1750	3182	1377	2510	4550	1799	3270	5918	2221	4030	7286	2643	4790	8654
3.89	39	102.2	116	240	464	538	1000	1832	960	1760	3200	1382	2520	4568	1804	3280	5936	2227	4040	7304	2649	4800	8672
4.44	40	104.0	121	250	482	543	1010	1850	966	1770	3218	1388	2530	4586	1810	3290	5954	2232	4050	7322	2654	4810	8690
5.00	41	105.8	127	260	500	549	1020	1868	971	1780	3236	1393	2540	4604	1816	3300	5972	2238	4060	7340	2660	4820	8708
5.56	42	107.6	132	270	518	554	1030	1886	977	1790	3254	1399	2550	4622	1821	3310	5990	2243	4070	7358	2666	4830	8726
6.11	43	109.4	138	280	536	560	1040	1904	982	1800	3272	1404	2560	4640	1827	3320	6008	2249	4080	7376	2671	4840	8744
6.67	44	111.2	143	290	554	566	1050	1922	988	1810	3290	1410	2570	4658	1832	3330	6026	2254	4090	7394	2677	4850	8762
7.22	45	113.0	149	300	572	571	1060	1940	993	1820	3308	1416	2580	4676	1838	3340	6044	2260	4100	7412	2682	4860	8780
7.78	46	114.8	154	310	590	577	1070	1958	999	1830	3326	1421	2590	4694	1843	3350	6062	2266	4110	7430	2688	4870	8798
8.33	47	116.6	160	320	608	582	1080	1976	1004	1840	3344	1427	2600	4712	1849	3360	6080	2271	4120	7448	2693	4880	8816
8.89	48	118.4	166	330	626	588	1090	1994	1010	1850	3362	1432	2610	4730	1854	3370	6098	2277	4130	7466	2699	4890	8834
9.44	49	120.2	171	340	644	593	1100	2012	1016	1860	3380	1438	2620	4748	1860	3380	6116	2282	4140	7484	2704	4900	8852
10.0	50	122.0	177	350	662	599	1110	2030	1021	1870	3398	1443	2630	4766	1866	3390	6134	2288	4150	7502	2710	4910	8870
10.6	51	123.8	182	360	680	604	1120	2048	1027	1880	3416	1449	2640	4784	1871	3400	6152	2293	4160	7520	2716	4920	8888
11.1	52	125.6	188	370	698	610	1130	2066	1032	1890	3434	1454	2650	4802	1877	3410	6170	2299	4170	7538	2721	4930	8906
11.7	53	127.4	193	380	716	616	1140	2084	1038	1900	3452	1460	2660	4820	1882	3420	6188	2304	4180	7556	2727	4940	8924
12.2	54	129.2	199	390	734	621	1150	2102	1043	1910	3470	1466	2670	4838	1888	3430	6206	2310	4190	7574	2732	4950	8942
12.8	55	131.0	204	400	752	627	1160	2120	1049	1920	3488	1471	2680	4856	1893	3440	6224	2316	4200	7592	2738	4960	8960
13.3	56	132.8	210	410	770	632	1170	2138	1054	1930	3506	1477	2690	4874	1899	3450	6242	2321	4210	7610	2743	4970	8978
13.9	57	134.6	216	420	788	638																	



## Typical Users

Aluminum Company of America  
American Cyanamid Company  
Bulova Watch Company  
Chrysler Corporation  
Dow Chemical Company  
E. I. Du Pont  
Ford Motor Company  
General Electric Company  
Remington Rand  
Shell Oil Company  
Union Carbide & Carbon Corporation  
Battelle Memorial Institute  
Johns Hopkins School of Medicine  
Mayo Clinic  
Massachusetts Institute of Technology  
Argonne National Laboratory  
Atomic Energy Commission  
National Bureau of Standards



THERMOLYNE CORPORATION  
DUBUQUE, IOWA — U.S.A.



# **TYPICAL USES OF THERMOLYNE PRODUCTS**

THE INFORMATION LISTED IN THIS BULLETIN WAS TAKEN FROM USER CARDS THAT ACCOMPANY THERMOLYNE PRODUCTS WHEN SHIPPED. THE USER CARD IS COMPLETED BY OUR CUSTOMER THEN RETURNED TO US INDICATING HOW THE PRODUCT IS BEING USED. APPLICATIONS ARE LISTED IN ORDER OF THOSE MOST FREQUENTLY MENTIONED.

## **THERMOLYNE CORPORATION**

2555 KERPER BLVD.  
DUBUQUE, IOWA 52003 U.S.A.

### **PORTABLE PYROMETER MILLIVOLTMETER**

Spot check readings of combustion furnace instruments  
General temperature indicators  
Bake out temperature controls  
Checking lab and production ovens  
Temperature determination of distillation columns  
Instructional use colleges  
Research temp. measurement  
Checking soldering points  
Heat rise test for electronic equipment  
Measuring stack temperatures of gases  
Temperature detection in electric furnaces  
Check exothermic temperatures in resins  
Determine temperatures in tritium combustion tubes  
Control temp. while running fire tube test on lumber  
Measure temperature of oil bath  
Measure temp. of limestone disintegration  
Checking transformation curves in metals  
Temperature measurements in general

PRINTED IN U.S.A.

Measure oven temp. on printing press  
Temp. measurement of ores & carbon  
Elevated temperature readings  
High school instructional use  
Monitoring kiln temp.  
Thermal shock measurements  
Record temp. of glass heating columns  
Checking temperature on food charts in hospitals

Check temp. of molten Al. used in die-casting operation  
Measuring gas flame temperature  
Calibration instrument  
Measure temp. of heat treating glass  
Checking heat of plastic extrusions  
Measure internal temp. of antennas under power  
300-lb solder pot temperature control  
Use in boiler plant  
Checking dynalog recorder temperatures  
Forest engineering research

BULLETIN NO. UTP-165



# THERMOLYNE ELECTRIC FURNACES

## TYPE 1300 FURNACE

Ashing samples  
High school chemistry and physics lab work  
Ignitions for gravimetric analyses  
General laboratory use  
Ashing of animal tissue & bone  
Inorganic ash residue  
School chem. physics laboratories  
Crystal growing  
Sewage treatment analysis  
Ignition work  
Melting metals, making alloys  
Heating substances for quantitative analysis  
Protein bound iodine determinations  
Analytical-quantitative sulphate determination  
Ashing of coal  
Ignitions determine of solids in H<sub>2</sub>O analysis  
Heating molds for silver castings  
Glass-making, fusion of salts  
Firing of enamel on silver and copper  
Annealing and diffusion processes

Fusions, metallurgy, fluxes and sulphur compounds  
Igniting CuO  
Testing high temperature materials  
Ashing precipitates in water analysis  
Driving CO<sub>2</sub> out of carbon boats  
Assay work  
Chemical analysis  
Quantitative analysis  
Catalyst drying  
Hardening  
Ignition of R<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> & MgO  
Firing silver electrodes on ceramics  
Ignition of soaps to determine ash content  
Baking samples  
Heat treatment of metals  
Ashing samples for Radioactive Count  
Low temperature annealing processes  
Dry sterilizing of oils and powders  
Heat treatment ceramic samples

## TYPE 1400 FURNACE

General Ashing  
Heat Treatment  
Ashing of tissue and biological material  
PBI determinations  
Ashing paper samples  
High school chemistry & Physics classes  
Hardening of bushings, punches and dies  
Heat treatment of firing pins, and other small gun parts  
Analysis of sewage  
Ignition of Precipitates  
Oil testing  
Conversion of Mn NO<sub>3</sub> & MnO  
Ashing leather

Ashing of radioactive precipitates  
Testing of potentiometric windings  
Ceramic firings  
Galvanometric analysis  
Assay of feeds  
Micro-determination of Zinc  
Catalytic activation  
Carburizing & hardening of cold & hot drawn steel  
Control work  
Ferrous & Non-ferrous analysis  
Electrochemistry  
Dry sterilizing of oils and powders

## TYPE 1500 FURNACE

General ashing  
Tempering & hardening of small steel parts  
Heat treatment of metals  
School chemistry & Physics classes, gen. use  
Sewage studies  
PBI determinations  
Quantitative experiments  
Ashing tissue, bone and other biological specimens  
Food analysis  
Ashing of paper pulp  
General low temperature lab work  
Routine lab use  
Ashing of lignite  
Heat treatment and cleaning of ceramic substrates  
Trace metal analysis in coke and bunker

Crucible ignitions  
Micro ash determinations  
Firing of Crucibles  
Soil testing  
Ashing vegetation for radioactive analysis  
Non-ferrous heat treatment  
Calcinating clay  
Diffusion in semiconductors  
Silver soldering  
Destroy mineral lattice in clay samples  
Baking filters  
Activation of silica gels  
Epoxy resin heat treatment  
High temperature testing of transducers (1800F)  
Calibration of thermocouples  
Drawing small stampings  
Blood lead determinations  
Dry sterilizing of oils and powders



## TYPE 1600 FURNACE

Ashing organic materials for analysis  
Heat treatment of tools & dies  
PBI determinations  
Hardening steel for fixtures  
General lab use  
Ignitions  
Heat treatment of clay minerals for identification  
High temperature fusion to 1400°F  
Heating organic salts to form oxides

Heating inorganic salts to form oxides  
Ashing of biological materials  
Incineration of feces  
Ashing of feeds  
Ash determination  
Incineration of sludge  
Research and control labs  
Chemical analysis  
Drying and sterilization of biological glassware  
Sterilization of oils and powders

## TYPE 1700 FURNACE

Organic ashings  
Heat treatment of steel  
PBI determination  
General lab use  
Ashing blood samples  
Metal heat treatment of small parts  
General Research  
Hardening of tool & dye parts  
Toolroom work  
Ashing of biological samples and feed samples  
Casehardening and annealing  
Carbon analysis

Isothermal heating of encapsulated samples  
Analytical baking of teflon  
Ashing meat and animal fats  
Annealing of metals  
Ashing of food samples  
Soil research  
Low temperature alloy melts  
Catalyst preparation  
Silver soldering on bronze  
Gold firing on various base materials  
Drying and sterilization of biological glassware  
Dry sterilization of oils and powders

## TYPE 1800 FURNACE

General heat treatment of metals  
Heat-treatment and tempering of die blocks & punches  
Hardening tool steels  
Annealing

Ashing  
Ashing of food samples  
Battery electrode processing  
School machine shops

## TYPE 1900 FURNACE

Heat treatment of alloy and stainless steel parts  
Analytical studies of soils, cement and salts  
Ignition of samples and precipitates in gravimetric analysis  
Research and control labs  
Dry sterilization of oils and powders  
Firing ceramics  
Annealing small parts & glass

Metal research  
Fusion of fused silicate powders  
Calcination  
Ashing milk powders at 1000°C  
Research in Petrology  
Ashing mineral wool  
Determining ash of mill effluent  
Drying and sterilization of glassware

## TYPE 2000 FURNACE

Gen. Lab uses  
School shops  
General heat treating  
Annealing  
Hardening and tempering  
Ashing of coal samples for volatile matter  
Ashing tissues  
PBI determinations  
Ashing of silicon & nickel  
Strain gauge cement curing  
Drying and sterilization of glassware

Ashing of toxicological specimens  
Gravimetric analysis  
Heat treatment of tool steel  
Ashing inorganic materials  
Burning volatile matter in sewage  
Quantitative analysis  
Quality control  
Dehydration at 150°C + 125°C  
Homogenization and fusion of silicates at 1050°C  
Calcination of catalysts  
Dry sterilization of oils and powders



## TYPE CP-500 TEMCOMETER CONTROLLER

Temperature control of Thermolyne furnaces  
Temperature control of furnaces other than Thermolyne-Temco units  
Temperature control ovens  
Temperature control of hot plates

Control of 6 unit Kjeldahl distillation apparatus for nitrogen determinations  
Temperature control for infrared heat panels  
Control temperature of strip heaters and heating mantles

## TYPE 8000 THERMOLYNE STEPLESS INPUT CONTROLLER

Routine use on lab. heating mantles  
General laboratory set-ups  
Control temp. of hot plate  
Operate low wattage laboratory heaters  
Gen. temperature control  
Control of water bath constant temp.  
Experimental work cancer research  
Controlling oil bath temperature

Control for electric tapes  
Liquifying waxes  
Small laboratory furnace control  
Melting point apparatus  
Heat reaction tubes  
Control 550 watt laboratory drying oven  
To control temperature on cutter column

## THERMOLYNE HOT PLATES

### TYPE 1900 HOT PLATE

Constant temp. bath and control studies  
Science experiments, elementary, secondary schools  
Evaporation during serum cholesterol determinations  
Blood chemistry  
Tissue embedding  
Heating & warming agar media  
Chemical & control analysis studies  
Cytological work  
Testing foods  
Extemporaneous compounding in pharmacy lab  
Soils analysis  
Urea nitrogen & prothrombin time studies  
Used to heat resistors before applying epoxy coating  
Constant temperature for acid hydrolysis of fats  
Heating stains and chemicals  
Quantitative analysis class work  
Heat source for sterilizer  
Heating Cu blocks for soldering  
Used to heat oil & alcohol for free fatty acid determinations  
Heating industrial detergents  
Sealing soap wrappers (Proctor and Gamble Co.)  
Evaporation of alcohol-ether mixture as used in serum cholesterol determinations  
Perchloric acid methods for PBI  
Soldering  
Heating brass parts for soldering purposes  
Extraction of chlorophyll from leaves  
Anti-freeze corrosion tests  
Heating adhesive materials  
Heating solutions for soaks & wet dressings (medical)  
Warming saline sol. for irrigational purposes  
Heating fracturing fluids

Heating asphalt samples  
Swell test on synthetic rubber  
Cholesterol extractions  
Rosins & paraffins  
Heating aggregates to reduce moisture contents  
Lapidary work  
Heating metal  
Sterilizer  
Acid evaporation  
Heating solvent  
Source of heat in organic synthesis and environmental testing  
Heating small plating bath  
Heating organic and aqueous solution  
Heating non-volatile residue  
Wet ashing  
Heating of wax  
Heating of acids  
Heating oil blends  
Evaporations in lipid studies  
Determine % of moisture in wood pulp  
Water testing  
Drying for spectroscopic analysis  
Slide warmer  
Melting wax to stick down parts on teflon slides  
Heat source for drying oven  
Heat distillation flasks  
Heating distill  $H_2O$  to provide humid air for testing parts  
Evaporation of  $H_2O$  from small planchets  
Heating for thermo measurements  
Optics  
Heating and annealing gold tubing  
Pathology laboratory general use  
Acid corrosion test  
Heating sol. in compounding antifreeze formulations



## TYPE 1900 HOT PLATE (Continued)

Used in surgery  
Drying microscope slides for fiber analysis  
Extraction of fats from spices, and meat products  
To temper steel parts after hardening  
Heating crystals for Ultrasonic soldering  
To heat metal clamps to be embedded in plastic  
Preheating aluminum mandrels  
Heat cold drink for acid check

Artificial aging of wet strength paper  
Fibre analysis work  
To reach liquid helium temperatures  
Heating Al. parts for shrink fits on Rotor shaft  
Making periodic checks on pressure cookers  
Moisture testing on oleo-margarine  
Making coffee, warming soups  
Domestic use  
Heating plastic bar, sheet, tube stock to malleability

## TYPE 2200 HOT PLATE

Constant temp. laboratory heating requirements  
Gen. lab uses  
Constant temperature 100°C. or below  
Evaporation studies  
Evaporation procedures  
Heating of water baths  
Distillation & digesting of liquids and salts  
Heating pressure cookers  
Digestion - non-routine evaporations  
Controlled heating of waxes, coatings and liquids  
Soldering operations  
Digestion of leaves for analysis as to chlorophyll, carotinoid and xanthophyll contents  
High school chem. & Phy. lab  
Soil analysis  
Boiling PBI determinations for Leffler Method which employs the use of perchloric acid  
Heating and sealing of plastic film wrapped packages  
Heating of analytical procedure  
Refluxing steroids  
Heating plastic bar, sheet, tube stock to malleability  
Attacking soil & rock samples

Acetone extracts & distillations  
Sulphur analysis  
Bio analysis  
Mounting silicon wafers, ultrasonic cuttings  
Pre-heating of tools, dies & molds  
Heating & sterilization of agar media for bacterial studies  
Experimental stress analysis  
Used in optical lab for cementing of lenses which requires controlled temperatures  
Coal testing  
Metallurgical lab  
Evaporation studies on soils  
Used to dry aggregates for analysis  
Autoclaving in 21 quart pressure cookers  
Control test for iron determinations in phosphoric acid (run every two hours)  
Test for iron content in soda ash  
Chemical analysis of Indium  
Heating dies  
Melting asphalt samples  
Drying mineral samples  
Soldering  
Heat asphalt and aggregates for small batch bituminous concrete pavement.

## TYPE 2300 HOT PLATE

Gen. lab research & heating  
Water bath  
Micro-analysis chemistry, biology  
Preparation of microscopic slide mounts  
College laboratory uses  
Serological examination  
Soldering of small parts  
Evaporation solutions  
Oil baths  
Recrystallization studies, micro techniques  
Preparation of samples for infra red spectroscopy  
Nitrogen and cholesterol non-protein extractions  
Precision heat source  
Laboratory distillations  
Microscopic slide warmer  
Micro heating  
Heating and evaporation of volatile solvents  
Organic synthesis

Metal reflux analysis  
Bacteriologic procedures  
Sand bath  
Dyeing of wool fabrics  
Dental laboratories processing acrylic material  
To heat ball bearings  
Demonstration clinics  
Heating solutions for frozen sectioning of tissue  
Tolulene extraction of water from wool  
Esterification  
Heating perfume compounds  
Oil extractions  
Bending frames for eye-glasses  
Plant ash reduction  
Testing of electronic components  
Micro-toxicological determinations  
Transfer room procedures (tissue)  
Fiber analysis  
Heating of plastics



## TYPE 2300 HOT PLATE CONTINUED

College uses in analytical chemistry  
Perchloric digestion of filtrates for PBI assay  
Fossil mounting of diatoms  
Junior high school lab  
Lipid extraction studies

Complex phosphate test  
Chromatography media  
Determine moisture in non-fat dry milk  
As a home-made incubator

## TYPE 2500 HOT PLATE

Heating solutions in general  
Gen. research and lab use  
Water baths  
Embedding of tissues  
Heating of inflammable liquids  
Heating of polyester resins  
Evaporation of radioactive samples  
Used on electroplating for heating solutions  
Junior high school uses  
Clinical pathology lab  
Lens cementing  
Cholesterol evaporations  
Water extraction

Constant temp for low milling point rare earth studies  
Making hot melts  
Melting waxes & fats  
Biochemical analysis  
Melting sulphur  
Used as heat source to convert refrigerator to incubator  
Evaporation studies  
Warming resin samples  
Medical research  
Heating dye samples  
Heating coffee

## TYPE 2600 HOT PLATE

General shop heating  
Water bath  
Heating asphaltic products  
Making biological media  
Evaporation of solvents for solids determination  
Heating solutions to enhance reaction  
Crucible heating  
Biochemistry studies  
Glass research work  
Limestone analyses

Soft solder operations  
Autoclaving  
Heating of sol. for pickling steel  
Pathology & spectroscopy analysis  
Routine analytical applications  
Heating oil samples  
Sterilization of instruments  
Rapid melting of frozen solutions  
Heating of volatile and inflammable solutions  
Annealing of gold conets  
Heat plating solution samples

## THERMOLYNE STIR PLATE, STIR LIGHT AND MAGNETIC STIRRERS

### MODEL SP-A1025B STIR PLATE

Gen. lab heating and stirring  
Bacteriological media preparation  
P.H. titrations  
Chemical analysis  
Control laboratories  
Organic lab work  
Hot titration studies  
Refluxing  
Thermal stability, reagent preparation  
Biochemical research  
Preparation of dyes for color analysis  
Endocrine studies  
High school chemistry classes  
Dialysis studies  
Pharmacology  
Nucleic acid extractions  
Mixing chloroform and organic mixtures  
Preparing suspensions  
Chemical synthesis

Acid-base titrations requiring constant temp.  
To keep solids suspended in Glycerol-Ethanol solvent  
Tantalum capacitor research  
Research in solubility  
Hydrogenation of fats and veg. oils  
Cell suspension for tissue cultures  
Recrystallization & distillation studies  
Insecticide synthesis  
Lime slaking experiments  
Stirring of oil baths  
Analysis of radioactive material  
Vacuum distillation  
Heating of colloidal suspensions  
Making small bath chemical dip for treatment of postharvest fruits & vegetables  
Process control uses  
Electroplating  
Sugar experimentations  
Washing resins



## TYPE S-7200 MAGNETIC STIRRER

Science classes, making solutions  
Mixing of photographic solutions  
Electroplating baths  
Stirring bacteriological and algae cultures

Stirring large volumes of aqueous solutions  
Sewage analysis  
Solvent agitation

## TYPE SL-7200 STIR LIGHT

Titration & extractions  
Research tool  
Preparation of drug solutions  
EDTA titrations  
Chloride titrations  
Magnesium titrations  
To keep medias in motion while dispensing

Titration of hard to see end points  
Calcium determinations on muscular tissue  
Monomer titrations  
Stirring sodium hydroxide solutions  
Volume analysis  
Titrations of uranium bearing solutions  
Algae growing

## TYPE S-7800 STIR MATE

Organic research general  
Miscellaneous stirring  
Titration stirring used with a PH meter and electrodes

Protein determinations  
Part of gradient elution system  
Stirring buffers and resins

## THERMOLYNE DRI BATH AND CULTURE INCUBATOR

### TYPE 5900 DRI BATH

Prothrombin determinations  
Blood banking  
Inactivation studies 56°C  
Cross matching for transfusions  
Incubation serums & cultures  
Serological studies  
Blood Rh Titers  
Coombs test  
For all clinical procedures requiring constant 37°C  
Research incubation of specimens at constant temp.  
Coagulation studies  
Incubate cross match samples  
V.D.R.L. Test (Venereal disease research laboratory test)  
Blood chemistries  
Phosphatase analysis

Rh antibody studies  
Phage assays determinations  
Enzyme incubation  
Heterophile  
Lee White coagulation studies  
Amylase determinations  
Pregnancy test  
Erythrocyte studies  
Blood chemistry  
Clotting times  
Anti human globulin studies  
Antibody work  
Maintain plasma & reagents at 37 C  
Drying samples in test tubes  
Facilitate clot formations studies  
Kahn flocculation tests  
Mazzini test  
Clotting times  
Transaminase determinations

### TYPE 6900 100°C DRI BATH

Drying PBI samples prior to ashing  
Blood chemistries including glucose levels  
Total lipid fraction  
Evaporation of solvents under stream of nitrogen

Taking solutions to dryness  
Dissolving precipitates in non-aqueous solutions



## TYPE 6700 DRI BATH FOR 37°C, 39°C, AND 56°C SETTINGS

Color development for PBI  
Pipette warmer for coagulation studies  
Inactivation of blood serums  
Enzyme reaction  
37°C routine incubation microbiology  
Prothrombin times  
Cholesterol determinations

Free fatty acid assay evaporating samples to dryness  
Biochemical test incubation  
Hold melted agar at pouring temperature  
Blood chemistry, general  
Hematology-clot retractions

## TYPE I-6825E CULTURE INCUBATOR

Bacteriological cultures  
Culturing throat allergy  
Checking for bacteria on manufactured products  
Chromosome culture  
Egg incubator (secondary schools)  
Incubation of peripheral blood for chromosome cultures  
Staining microscope slides

Incubate T7 culture plates  
Incubate VU slants  
Tissue culturing  
Incubate - milk & water samples  
Incubate PGD tuberculin test  
Holding incubator surgery  
E.E.N.T. Cultures, doctors offices  
Blood culturing

## TYPE 6500 LABORATORY LIGHT

Bacteria colony counter (Spores)  
Serology-blood typing  
Rh typing box  
Febrile agglutination studies  
Prothrombin light  
Titration viewer  
Viewing slides  
Color reaction studies  
Illuminate test wells in Thermolyne Dri-Baths  
Viewing photographic plates  
Reading sensitivity studies  
Low power microscope illuminator  
Balance illuminator  
Paper chromatography illuminator  
X-ray  
Inspection purposes (Industry)  
Supplementary light in lab without windows  
Micro-titration

Light box for checking negatives  
Tissue slide warmer  
Used to see acute changes in non-esterified fatty acid filtrations  
Viewing precipitates  
Phosphatase test illuminator  
Viewing electron microscope negatives  
Transparency studies  
Viewing electron micograph plates  
Turbidimetric studies  
Illuminate cellulose strips, electrophoresis studies  
Illuminate colloidal gold curves in radioactive Rx  
Virus plaque counter  
Removing plasma from blood bottles  
Kahn light  
Laboratory dissecting light  
Backlighting pathology and neuroanatomy demonstrations